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NUCLEAR SCIENCE ABSTRACTS

Volume 11 March 31, 1957 No. 6A

GENERAL

ATOMIC POWER

3266 NP-6162
Japan. Atomic Energy Research Inst.
DESCRIPTION OF THE JAPAN ATOMIC ENERGY RESEARCH INSTITUTE. Aug. 1, 1956. 16p.

The activities of the Atomic Energy Research Inst. are set to meet the basic principle of the Atomic Energy Basic Act for peaceful purposes. Basic and applied research in atomic energy, design, construction, and operation of nuclear reactors, training and education of nuclear scientists and engineers, importation, production, and distribution of radioisotopes, collection of information and data concerning peaceful uses of atomic energy, and publication of results of research are discussed. (J.E.D.)

3267 AD-72787
SOVIET UNION: ATOMIC ENERGY FOR LONG-RANGE ROCKETS. (Sowjet-Union: Atomenergie Fur Langstrecken-Raketen.) Translated from Flugwelt 84, 630(1954). 4p. (F-TS-8407/III).

An excerpt from the official newspaper of the Soviet Army, the Krasnaja Swesda (Red Star) discusses the possibilities of using nuclear fuel for long-range rockets. Velocities and weights of the propellant are briefly discussed. (W.L.H.)

3268
WORLD'S LARGEST ATOMIC POWER STATION FOR SCOTLAND. Atomics 8, 5-6(1957) Jan.

A brief description is presented of design features of an atomic power station to be built at Hunterston near Glasgow, Scotland. Power will be derived from the heat generated by a controlled nuclear fission chain reaction in two nuclear reactors. The natural uranium fuel will be contained within a pile of graphite moderator material, and the heat extracted by circulating carbon dioxide gas under pressure. The generating capacity of the station will be 360,000 kw. The savings in coal is estimated to be at least one million tons a year. (C.H.)

3269
NUCLEAR POWER FOR AIRCRAFT. W. H. L. Porter. Atomics 8, 7-14(1957) Jan.

Considerations determining the design of an aircraft propelled by nuclear power are reviewed. Factors influencing reactor design, heat transfer systems, coolants, reactor stability, and shielding are discussed. Crash hazards are considered. It is concluded that the liquid metal cooled reactor is the only possibility for aircraft propulsion. (C.H.)

3270
METALLURGY IN THE NUCLEAR POWER INDUSTRY. W. E. Dennis (The G.E.C./Simon-Carves Atomic Energy Group). Metallurgia 55, 23-6(1957) Jan.

The manner in which certain metallurgical aspects in the nuclear power industry is approached by the G.E.C./Simon-Carves Atomic Energy Group is presented. Future requirements are briefly discussed. (auth)

3271
PROBLEMS AND PERSPECTIVES OF ATOMIC POWER. G. N. Kruzhilin. Priorda 46, No. 11, 7-18(1956) Nov. (In Russian)

Refer also to abstract 3559.

RESEARCH PROGRAMS

3272 RM-1711(RAND)
RAND Corp., Santa Monica, Calif.
THE SOVIET UNION AND THE ATOM: THE EARLY YEARS. M. J. Ruggles and A. Kramish. Apr. 2, 1956. 105p.

A review and discussion of nuclear research in the U.S.S.R. up to 1941 is offered. The relationship of science to the government and how this affected developments in prewar Russian nuclear science is discussed. (T.R.H.)

3273
ATOMIC ENERGY IN EASTERN EUROPE. PART 2. CZECHOSLOVAKIA. J. F. Calor. Nuclear Eng. 2, 28-9 (1957) Jan.

BIOLOGY AND MEDICINE

RADIATION EFFECTS

3274 AECU-3030
Michigan. Univ., Ann Arbor.
STUDY OF THE BIOLOGICAL EFFECTS OF IRRADIATION. Progress Report for Period of January 16, 1953 to January 15, 1954. Frank H. Bethell. 109p. Contract AT(11-1)-75. $16.80(ph OTS); $5.70(mf OTS).

Progress is reported in studies on the survival of experimental animals after total-body irradiation, and in studies on the fundamental problems concerned with the biochemical, physiological, and hematological effects of irradiation on experimental animals. Data are included from studies on the role of the pituitary in blood cell regeneration after radiation injury, blood coagulation problems, the effects of irradiation on enzyme systems, and the effects of x irradiation on Trichinella spiralis and on control of trichinosis by γ irradiation of pork. (C.H.)

3275 WT-1215
Food and Drug Administration, Washington, D. C. and Federal Civil Defense Administration, Battle Creek, Mich.
EFFECTS OF NUCLEAR EXPLOSIONS ON FROZEN FOODS. H. P. Schmitt. Mar. 1956. 17p. Project 32.5 [of] OPERATION TEAPOT. $0.20(OTS).

Samples of frozen foods representing major pack items and container types currently in use were exposed to the effects of a nuclear explosion. Exposure was made at close-in positions and in freezers located in homes. Recovered samples were found to be free of physical and thermal damage. Kinesthetic evaluation proved the retention of flavor, color, appearance, and texture. Scientific tests indicated the retention of vitamins, minerals, and

proximate composition at all exposures well within ranges observed during good commercial manufacture. Samples from exposures in homes were recovered free of induced radiation. It is concluded that, under emergency conditions similar to this exposure, frozen foods may be used for both military and civilian feeding. (auth)

3276

EFFECTS OF PRELIMINARY IRRADIATION UPON THE SUBSEQUENT RADIORESISTANCE OF MICE. N. V. Luchnik and V. G. Kulikova. Doklady Akad. Nauk S.S.S.R. 110, 982-4(1956) Oct. 21. (In Russian)

3277

TISSUE CULTURE METHOD IN INVESTIGATION OF X-RADIATION EFFECTS ON THE HEMATOPOIETIC ORGANS (SPLEEN) OF MICE. A. F. Ivanitskaya (Severtsov Inst. of Animal Morphology). Doklady Akad. Nauk S.S.S.R. 110, 978-81(1956) Oct. 21. (In Russian)

The viability of the reticular tissue cells after total body irradiation (up to 5000 r), the cytology of various cell elements composing the spleen, and the nature of the destructive processes were studied. (R.V.J.)

3278

IS THE PARENCHYMA OR THE STROMA OF AN ORGAN THE PRIMARY TARGET OF X-IRRADIATION? T. S. Argyris and H. B. Chase (Syracuse Univ., N. Y. and Brown Univ., Providence, R. I.). Exptl. Cell Research 11, 646-7 (1956) Dec.

Mouse skin was irradiated at various stages of the hair growth cycle in an attempt to add more information to this problem. Data are presented from studies on the response to x irradiation of resting follicles present in skin at a variety of growth stages of the hair cycle. (C.H.)

3279

ON CERTAIN REGULARITIES IN IONIZING RADIATION EFFECTS ON MICROÖRGANISMS. E. N. Sokurova (Inst. of Microbiology). Izvest. Akad. Nauk S.S.S.R. Ser. Biol. No. 6, 35-53(1956) Nov.-Dec. (In Russian)

3280

EFFECT OF GAMMA RADIATION ON GASTRIC EMPTYING TIME IN THE DOG. R. A. Conard (National Naval Medical Center, Bethesda, Md.). J. Appl. Physiol. 9, 234-6(1956) Sept.

3281

ACTIVITY OF BLOOD AND TISSUE CHOLINESTERASE IN ANIMALS EXPOSED TO THE LETHAL AND SUB-LETHAL DOSES OF IONIZING IRRADIATION. N. E. Ponomarenko (Leningrad Inst. of Roentgen-Radiology). Med. Radiol. 1, No. 5, 13-16(1956) Sept.-Oct. (In Russian)

3282

CHANGES IN ORGANISM REACTIONS TO BARBITURATES AND OTHER DRUGS DURING THE TOTAL BODY IRRADIATION. V. B. Isachenko (Inst. of Experimental Medicine). Med. Radiol. 1, No. 5, 59-64(1956) Sept.-Oct. (In Russian)

3283

EFFECTS OF CHRONIC INDUCTION OF RADIOACTIVE CERIUM INTO THE GASTROINTESTINAL TRACT OF RATS. Yu. I. Moskalev and V. I. Strel'tsova. Med. Radiol. 1, No. 6, 14-20(1956) Nov.-Dec. (In Russian)

3284

ALTERATIONS IN BLOOD PICTURE OF HEMORRHAGING RABBITS EXPOSED TO BETA-RADIATION. O. I. Komarova (Sverdlovsk Inst. of Sanitation and Professional Pathology). Med. Radiol. 1, No. 6, 21-4(1956) Nov.-Dec.

3285

CONTENT OF CREATINE AND CREATININE IN THE URINE OF RATS EXPOSED TO X-RADIATION. T. A. Fedorova and M. A. Larina. Med. Radiol. 1, No. 6, 36-40 (1956) Nov.-Dec. (In Russian)

3286

PEPSIN DIGESTION OF ALBUMEN SERUM EXPOSED TO GAMMA RADIATION WITHIN OR WITHOUT THE ORGANISM. Ya. A. Epshteĭn and E. A. Zabozlaeva (Ab Ali Ibn-Sin Stalinabad Med. Inst.). Med. Radiol. 1, No 5, 65-9(1956) Nov.-Dec. (In Russian)

3287

THE FOOD SCIENTIST LOOKS AT RADIATION PRESERVATION. R. S. Hannan and B. Coleby (Food Investigation Organization of the Dept. of Scientific and Industrial Research, Univ. of Cambridge). Nuclear Power 2, 8-11(1957) Jan.

A survey was made on the use of ionizing radiation for processing foodstuffs considering existing food processing methods and ionizing radiation methods applied to meat, fruits, vegetables and package materials. (F.S.)

3288

THE PRODUCTION OF TUMOROUS ABNORMALITIES IN FERN PROTHALLI BY IONIZING RADIATIONS. Carl R. Partanen and Taylor A. Steeves (Harvard Univ., Cambridge, Mass.). Proc. Natl. Acad. Sci. (U.S.) 42, 906-9(1956) Dec.

Spontaneous tumorous abnormalities occur relatively rarely in aseptic in vitro cultures of the prothalli of P. aquilinum (the bracken fern). By treating either ungerminated spores or young prothalli with either x rays or γ radiation, tumors, which appear in every way comparable to the spontaneous ones, can be produced in quantity. With further refinement of the quantification of this technique, it promises to become a valuable tool for investigations into problems of tumorization and some of the factors involved. (auth)

3289

DETERMINATION OF THE RBE OF ALPHA-PARTICLES FROM ASTATINE-211 AS COMPARED TO BETA-PARTICLES FROM IODINE-132 IN THE RAT THYROID. Johan K. Basson and Claire J. Shellabarger (Brookhaven National Lab., Upton, N. Y.). Radiation Research 5, 502-14(1956).

The results of a study of the effects of α-particles from At^{211} and β-particles from I^{132} on the capacity of the thyroid gland to accumulate I^{131} are presented. It appears that a β-particle dose of 2.8 times the corresponding α-particle dose was required to produce the same depression in I^{131} uptake. (auth)

3290

INTRAVENOUS APPLICATION OF RADIOACTIVE Au^{198}. Theodor Fliedner and Rudolf Stodtmeister. Strahlentherapie 101, 289-95(1956) Oct. (In German)

After intravenous application of colloidal radioactive gold (Au^{198}) a destruction is effected in the bone marrow of the rat by extinction of cells, edema, hemorrhage, and fat infiltration. The injury to the sinus system is of great pathogenic importance in this process. The findings underline the necessity of careful hematological control in the clinical use of gold colloid (Au^{198}). (auth)

3291

THE HEMATOLOGICAL BASIS FOR THE EVALUATION OF RADIATION PROTECTION. Rudolf Stodtmeister, Theodor M. Fliedner and Stefan Sandkuhler. Strahlentherapie 101, 296-307(1956) Oct. (In German)

3292

CONCERNING THE REGENERATION OF LYMPHORETICULAR TISSUE AFTER RADIATION INJURY. Rudolf Pape and Alexandra Piringer-Kuchinka. Strahlentherapie 101, 523-35(1956) Dec. (In German)

The regeneration of the lymphoreticular tissue of the spleen after 1000 r regional irradiation has been examined on 39 rats. The rapid decay is matched by a similar process of proliferation of the remaining large and small reticulum cells. Within 27 to 30 hours the follicle poor in

cells becomes abundant in cells. The amitosis and especially the meroamitosis observed in this connection are of highest importance. Whereas the destructive processes are dependent on the dose of rays, the regeneration is subordinate to the correlation with the rest of the body. (auth)

3293

SCIENTIFIC AND PRACTICAL PROBLEMS OF RADIATION. M. N. Meisel and N. D. Chernyaev. Vestnik Akad. Nauk S.S.S.R. 26, 38-45(1956) Nov. (In Russian)

A review. (R.V.J.)

3294

THE EFFECT OF EXPOSURE TO THE ATOMIC BOMBS ON PREGNANCY TERMINATION IN HIROSHIMA AND NAGASAKI. J. V. Neel and W. J. Schull. Washington, National Academy of Sciences—National Research Council. 1956. 241p.

Information is presented concerning the relationship between irradiation and the outcome of 76,626 pregnancies terminating in Hiroshima and Nagasaki between 1948 and 1953. Aspects of pregnancy considered include sex of infant, occurrence of major malformation, viability at birth, birthweight, and occurrence of death during the first six postpartum days. In addition, on a random sample of 19,818 pregnancy terminations followed up at age nine months, data were obtained on infant survival up to nine months postpartum, malformations which had become apparent since the previous examination, and growth of the child reflected in certain anthropometric measurements. The variation in potential indicators of radioinduced genetic changes were analyzed in relation to the experience of the parents at the time of the atomic bombings. (C.H.)

Refer also to abstract 3477.

RADIATION HAZARDS AND PROTECTION

3295 AERE-HP/R-2017

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

THE RADIOLOGICAL DOSE TO PERSONS IN THE U.K. DUE TO DEBRIS FROM NUCLEAR TEST EXPLOSIONS PRIOR TO JANUARY 1956. N. G. Stewart, R. N. Crooks, and E. M. R. Fisher. Sept. 1956. 29p.

An account is given of the methods used to measure the amount of radioactive material in the air above the United Kingdom and the amount deposited on the ground, as a result of all atomic weapons exploded between January 1951 and January 1956. Based on these measurements it is estimated that between 1954 and January 1956 Sr^{90} was deposited on the U. K. at the rate of 2.3 mc/km^2 year and the concentration on the ground reached a value of 4.5 mc/km^2 of 1st January 1956. Due to the hold-up in the stratosphere of dust from thermonuclear explosions, the ground concentration of Sr^{90} from weapons exploded before January 1956 is expected to increase gradually and to pass through a maximum value of 14 mc/km^2 in about 1968. Weapons exploded since January 1st 1956 will add a further contribution. If the present rate of firing is continued, it is estimated that an equilibrium value of 200 mc/km^2 of Sr^{90} may be reached in approximately 100 years time. (C.H.)

3296 CF-53-3-47

Oak Ridge National Lab., Tenn.

CONTROL OF RADIATION EXPOSURE IN THE ORNL PILOT PLANT. G. S. Sadowski. Mar. 9, 1953. Decl. Dec. 9, 1954. 29p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

A program is outlined for the prevention and control of personnel radiation exposures in a separations plant. A detailed analysis was made of personnel exposures in an existing pilot plant. The effectiveness of the program for radiation control depends upon adequate design and installation of equipment; routine survey measurements and segregation of radioactive areas; and a systematic, detailed study of all radiation sources. The procedures established for the control of personnel exposures included a detailed daily examination of the exposure record of each individual; a weekly meeting with health physics personnel to review the exposure records and planning of the individual permissible exposures for the ensuing week; and a follow-up of the subsequent exposure of each individual. (C.H.)

3297 HW-47170

Hanford Atomic Products Operation, Richland, Wash.

RADIOACTIVITY LEVELS OF THE COLUMBIA RIVER BELOW RICHLAND, WASHINGTON FOR THE PERIOD JULY, AUGUST, SEPTEMBER 1956. H. V. Clukey. Dec. 10, 1956. 9p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

In the Columbia River downstream from Richland, Washington there is a gradual decrease in concentration of radioactive isotopes. At any one location there are fluctuations due to factors such as dilution and decay time. During this period at all locations the concentration of α particle emitters in water averaged below the detection limit of 5×10^{-9} μc/cc. In mud, all α particle emitter concentrations were below the detection limit of 3×10^{-6} μc/gm. Beta particle emitters in water upstream of McNary Dam increased slightly due to normal decreased river flow this quarter, with averages at various locations ranging from $(3 \text{ to } 25) \times 10^{-7}$ μc/cc, but in river mud the averages of 2×10^{-5} μc/gm were about the same as the previous quarter. Downstream from McNary Dam, beta particle emitter average concentrations in water were about the same as the past three quarters. The low river flow of 420,000 gallons per second on September 14 was the lowest September flow since prior to 1948. (auth)

3298

RADIATION DOSES TO PATIENTS AND PERSONNEL IN MODERN ROENTGEN DIAGNOSTIC WORK. Lars-Eric Larsson (King Gustaf V Jubilee Clinic, Stockholm, Sweden). Acta Radiol. 46, 680-9(1956) Nov.

3299

SOME MEASUREMENTS OF SCATTERED RADIATION FROM ROENTGEN DIAGNOSTIC BEAMS. Jon Flatby and Sem Maudal (State Inst. of Radiophysics, Oslo, Norway). Acta Radiol. 46, 690-9(1956) Nov.

3300

PERMISSIBLE DOSE PROBLEMS WITH SPECIAL REFERENCE TO DIAGNOSTIC PROCEDURES. M. H. Poppel, H. G. Jacobson, J. Stein, and G. J. Jerry. (New York, N. Y.) Am. J. Roentgenol. Radium Therapy and Nuclear Medicine 77, 138-43(1957) Jan.

Permissible dose problems are discussed. A new simple method for recording radiation dosage received by patients during roentgenologic diagnostic procedures is described. Methods for recording radiation dosages received by radiologic staff members are briefly described. (auth)

3301

ESTIMATION OF WHOLE-BODY RADIATION DOSES IN ACCIDENTAL FISSION BURSTS. Joseph G. Hoffman and Louis H. Hempelmann (Roswell Park Memorial Inst., Buffalo, N. Y. and School of Medicine, Univ. of Rochester, N. Y.). Am. J. Roentgenol. Radium Therapy and Nuclear Medicine 77, 144-60(1957) Jan.

In two nuclear accidents involving uncontrolled fission reactions 9 persons were inadvertently exposed to complex

ionizing radiations. Whole body doses are computed on the assumption that serum Na^{24} slow-neutron-induced activity provides a measure of fast-neutron intensity. The self-dosage in the human body due to gamma radiation from slow neutron capture in hydrogen is computed on the basis that the serum Na^{24} activity gives a measure of slow-neutron density. Measurements of gamma ray intensities about a mock-up man filled with Na^{24} in water are described. The assay of induced Na^{24} in the sera of humans by a measurement of gamma ray intensity at the anterior diaphragm is discussed. Slow-neutron-induced activities although measurable are found to be negligible insofar as radiation dosage is concerned. In decreasing order of magnitude the dose components are: fast neutrons, hydrogen capture gamma rays, N^{14} captures, and prompt gamma rays. Doses are expressed in average rep throughout the body, integral dose, terms of incident r delivered by I Mev gamma and soft roentgen rays, and the serum Na^{24} induced activities. (auth)

3302

MEANS FOR INDIVIDUAL PROTECTION IN HANDLING RADIOACTIVE ISOTOPES. S. M. Gorodinskiĭ. Med. Radiol. 1, No. 5, 84-91(1956) Sept.-Oct. (In Russian)

3303

ON THE PROBLEMS OF DECONTAMINATION OF COTTON CLOTHES FROM RADIOACTIVE DIRT. N. Yu. Tarasenko. Med. Radiol. 1, No. 5, 91-6(1956) Sept.-Oct. (In Russian)

3304

EFFECTS OF SMALL DOSES OF IONIZING RADIATION ON THE BLOOD PICTURE OF PERSONNEL; THE ASPECTS OF PROFESSIONAL HAZARD. M. B. Golubitskaya (Inst. of Oncology). Med. Radiol. 1, No. 6, 6-13(1956) Nov.-Dec. (In Russian)

3305

RADON CONTENT OF THE AIR. F. Behounek and M. Majerova (Czechoslovak Academy of Sciences, Prague). Nature 178, 1457(1956) Dec. 29.

3306

MAXIMUM PERMISSIBLE INTERNAL DOSE OF RADIONUCLIDES: RECENT CHANGES IN VALUES. K. Z. Morgan (Oak Ridge National Lab., Tenn.). Nuclear Sci. and Eng. 1, 477-500(1956) Dec.

The development of dose rate standards and dosage units is briefly described. The recommendations of the April, 1956 meeting of the International Commission on Radiological Protection are summarized and the effects of these recommendations on operations of large atomic energy installations are discussed. It is concluded that, because of the conservative practice of health physics in the past, the new ICRP proposed changes in exposure standards will not require any major alteration of current practices. (auth)

3307

CURRENT RESEARCH FINDINGS ON RADIOACTIVE FALLOUT. Willard F. Libby (U. S. Atomic Energy Commission, Washington). Proc. Natl. Acad. Sci. (U.S.) 42, 945-62(1956) Dec.

Immediate and delayed hazards from atomic explosions are reviewed. Factors affecting the dissemination of fallout are discussed. The characteristics of Sr^{90} and hazards from the ingestion of Sr^{90} are considered. Data are tabulated on the Sr^{90} content of samples of biological material collected from various parts of the world between 1952 and 1956 and of soil samples collected from various parts of the world at various times following the explosion of a thermonuclear device in 1955. (C.H.)

3308

PROPHYLAXIS AND THERAPY OF RADIODERMATITIS WITH AZULON PREPARATIONS. Gunther Barth and Viktor Neff. Strahlentherapie 101, 436-41(1956) Nov. (In German)

Carrying out experiments on animals the authors have been able to prove the efficacy of azulon preparations in the prophylaxis of skin injuries due to x-rays. The report presents observations of five years on comparative experimentation and wide-scale application of the said preparations in the roentgenotherapy of 1800 patients. The prophylactic and therapeutic efficacy of the azulon preparations is stated to be excellent. Clinical instructions for the use of the preparations are given by the authors. (auth)

3309

INVESTIGATION OF BIOLOGICAL PROTECTIVE AGENTS. PART XVI. ON THE PROTECTIVE EFFECTS OF CYSTEAMINE ON ACUTE RADIATION MORTALITY OF MICE. Hanns Langendorff and Alexander Catsch. Strahlentherapie 101, 536-41(1956) Dec. (In German)

The influence of a preliminary application of cysteamine on the acute radio-mortality of mice is less pronounced in the case of fractionated irradiation than in the case of single irradiation. Cysteamine and/or fractionation of the radiation dose cause an increase of the LD_{50} values and a change of the shape of the dose effect curves. The authors discuss the different possible reasons for the incomplete additivity of both factors. The ideas developed by the authors represent a tentative hypothesis according to which cysteamine and the time factor act particularly on a certain mechanism of mortality in which the recuperative power and the possibility of being influenced are not unlimited. (auth)

3310

ATOMIC ENERGY IN ITS REPERCUSSIONS ON LIFE AND HEALTH. (Papers from a Scientific Conference held at National Museum of Natural History, July 1-2, 1955). Paris, L'Expansion Editeur, 1956. 254p. 1,000 frames. (In French)

The papers given at the July 1955 conference in Paris on the dangers of atomic energy and radiation are presented. The topics discussed include the dangers inherent in atomic equipment, the radioactive effects of atomic explosions, a review of the analyses made in Japan of the radioactive ash from the March 1954 Bikini explosion, long distance propagation and characteristics of the radioactive particles emitted in atomic explosions, eventual influences of atomic explosions on evolution, radioactivity in air and rain, radioactive clouds, meteorological effects of atomic explosions, a general review of the biological effects of ionizing radiation, medical problems posed by the immediate effects of atomic explosions, cataracts received from explosions or research in atomic energy, atomic radiation and aquatic life, biological danger from powders emitting β rays, effect of weak doses of radiation, ionizing radiation and the future of human heredity, protection against radiations, aerosols and radioactive gases in atomic industry, and therapy for radiolesions. (B.J.H.)

Refer also to abstracts 3480 and 3481.

RADIATION SICKNESS

3311

FORMATION OF BONE GROWTH DURING RADIATION SICKNESS. A. G. Zemlyanoi. Med. Radiol. 1, No. 5, 72-4 (1956) Sept.-Oct. (In Russian)

3312

EFFECTS OF VAGOSYMPATHETIC NOVOCAINE BLOCKAGE OF THE NECK ON THE COURSE OF ACUTE RADIATION SICKNESS OF DOGS. A. N. Gamaleya, A. A. Gyurdzhian, A. A. Zhgun, and P. V. Simonov (Burdenko Military

Hospital, Ministry of Defense). Med. Radiol. 1, No. 6, 3-5 (1956) Nov.-Dec. (In Russian)

3313
ABOUT THE USE OF BLOOD-FORMING STIMULANTS IN RADIATION LEUKOPENIA. Yu. G. Grigor'ev. Med. Radiol. 1, No. 6, 57-61(1956) Nov.-Dec. (In Russian)

3314
ON REDUCING THE EFFECTS OF LOCAL RADIATION RESPONSE. L. M. Sherman (Molotov Research Inst. of Roentgenology and Radiology). Med. Radiol. 1, No. 6, 61-5 (1956) Nov.-Dec. (In Russian)

RADIOTHERAPY

3315
EXPERIMENTS IN THERAPEUTIC USE OF RADIOACTIVE IODINE IN THYROTOXICOSIS. A. A. Garagash'yan (Stanislavskĭ Medical Inst.). Med. Radiol. 1, No. 5, 74-80 (1956) Sept.-Oct. (In Russian)

3316
DETERMINATION OF β RAY DOSAGE FROM THE Ce^{144} APPLICATOR. E. V. Utekhin (Central Research Inst. of Roentgen-Radiology). Med. Radiol. 1, No. 6, 90-1(1956) Nov.-Dec. (In Russian)

3317
RADIATION TREATMENT OF TUMORS OF THE BLADDER. Josef Becker. Strahlentherapie 101, 208-16(1956) Oct. (In German)

The author describes the different radiologic treatment methods for the therapy of tumors of the bladder. Besides the infiltration with radioactive isotopes (P^{32} and Au^{198}) the endovesical contact irradiation with cobalt beads or the macrosuspension are used on a large scale for local treatment. External irradiation can be carried out with roentgen deep therapy and with the 15 Mev-Betatron with both electrons or gamma-rays. In a summary analysis report is given on the therapy results of 245 patients treated in the period between 1952 and 1954. (auth)

3318
EXPERIENCE IN THE TREATMENT OF MALIGNANT TUMORS OF THE SINUSES. Werner Schwab, Karl Werner and Herbert Kaess. Strahlentherapie 101, 227-40(1956) Oct. (In German)

The authors communicate their experiences in the combined surgical and radiological therapy of the malignant tumors of the accessory sinuses. The numbers of definitive cure amounted to less than 30% before the introduction of cobalt therapy, afterwards to almost 40%. The report deals with the possibilities of radiotherapy by means of the betatron and presents the results of isodose determinations. (auth)

3319
INTERSTITIAL IRRADIATION WITH RESORBABLE MATERIAL. Josef Becker and Kurt Ernst Scheer. Strahlentherapie 101, 278-82(1956) Oct. (In German)

The authors report on a method of interstitial irradiation by means of hollow threads of a resorbable material filled with an insoluble compound of a shortlived beta-emitting isotope. The irradiation being terminated by the natural decay of radioactivity and the carrier of radiation being resorbed, the implant need not be removed. As indication for threads filled with P^{32}, the implantation in the case of cavernous hemangiomas of the eyelids, the nose, the auricle, and the mucosa of the mouth has been successful. The use of Y^{90} as activity is discussed. (auth)

3320
RADIOACTIVE YTTRIUM Y^{90} AS A RADIATION SOURCE FOR PLEURAL AND PERITONEAL APPLICATION. Kurt Ernst Scheer. Strahlentherapie 101, 283-8(1956) Oct. (In German)

In experiments on rats the author has tested Y^{90} for its fitness as radiating source in the treatment of pleural and peritoneal carcinoses. It was used in form of a colloidal hydroxide stabilized by dextran. Compared with Au^{198} colloid, Y^{90} colloid shows less affinity concerning the organs of the reticulo-endothelial system and after intravenous injection no influence on the number of lymphocytes in the peripheral blood can be observed, whereas the Au^{198} colloid applied in a quantity equivalent to the beta-dose lowers the number of lymphocytes to a third of the initial value. The production of Y^{90} is less difficult and less expensive than that of Au^{198}. (auth)

TRACER APPLICATIONS

3321 HW-44890
Hanford Atomic Products Operation, Richland, Wash.
THE FOLIAR SORPTION OF IODINE BY PLANTS. A. A. Selders and F. P. Hungate. Sept. 1, 1956. 11p. Contract W-31-109-Eng-52. $0.15(OTS).

Iodine gas is taken up both by the epidermis and the mesophyll tissue of the leaf. The rate of uptake depends on the I_2^{131} concentration in the air with an average value of $(5.4 \pm 3) \times 10^4$ μ c/g per /uc/cc of air per hour. The presence of stable iodine along with radioactive iodine did not reduce the amount of I^{131} sorption to the leaf but did reduce the amount translocated in the plant. Five per cent or less of the total iodine sorbed by a leaf was translocated to other plant parts during 3 days following exposure to either gaseous iodine or iodide in solution. (auth)

3322 HW-45505
Hanford Atomic Products Operation, Richland, Wash.
A CONTROLLED ENVIRONMENT GROWTH CHAMBER FOR PLANTS. J. H. Rediske, A. A. Selders, and J. F. Cline. Sept. 11, 1956. 8p. Contract W-31-109-Eng-52. $0.15(OTS)

A unit for the growth of plants in the laboratory under controlled conditions is described. It is semi-portable and can be used for growth studies with either soil or nutrient as the substrate. It is particularly well adapted for use with radioisotopes. (auth)

3323
IS LYSINE THE SOURCE OF THE PYRIDINE RING IN NICOTINE? A. A. Bothner-By, R. F. Dawson, and D. R. Christman (Brookhaven National Lab., Upton, N. Y.). Experientia 12, 151(1956).

If one applies L(+) lysine-$\epsilon-N^{15}$ or L(+) lysine labeled in all positions with C^{14} to sterile cultures of the roots of Nicotiana tabacum, the roots produce nicotine which contains small quantities of N^{15} or C^{14}. The nicotine contains more N^{15} or C^{14} in the pyrrolidine ring than in the pyridine ring. Therefore lysine does not lie in the direct biogenetic scheme for nicotine. (tr-auth)

CHEMISTRY

3324 AD-98464
Columbia Univ., New York. School of Mines.
PHYSICAL CHEMISTRY OF NaCl-KCl MELTS CONTAINING DISSOLVED TITANIUM CHLORIDES. Final Report [for] February 1, 1953 to April 30, 1956. Warren C. Kreye. June 1956. 39p. Contract Nonr-266 (24).

3325 AECU-3383
New Mexico. Univ., Albuquerque.
PROGRESS REPORT NO. 22 UNDER CONTRACT SC-5.

Dec. 1, 1956. 24p. For [Los Alamos Scientific Lab. Contract W-7405-eng-36], Subcontract 5. $4.80(ph OTS); $2.70(mf OTS).

The study of methods by which the non-iodate component of the "Z" fraction is prepared has been completed. The study of the adsorption of In^{115} from aqueous solution was continued. The preparation and properties of some $UCl_5.2PCl_5$ are presented. Synthesis of some oxazoles is included. The distribution of organic acids between amyl alcohol and water is presented. (For preceding period see M-6007.) (W.L.H.)

3326 CCC-1024-TR-209
Callery Chemical Co., Penna.
REACTIONS OF SODIUM BOROHYDRIDE WITH AMINE SALTS. H. W. McDanel and L. S. Stone — P. M. Maginnity, ed. Nov. 20, 1956. 16p. Contract [NOa(s)-52-1024-c].

Reactions of sodium borohydride with various amine hydrochlorides were investigated to prepare volatile boron-nitrogen hydrides. Compounds obtained include N, N', N''-trimethylborazine (from methylammonium chloride), ethylenediammonium diborohydride, ethylenediamine-bisborane, trimethylamineborane, pyridine-borane, dimethylaminodiborane (from dimethylammonium hydrogen sulfate), and diborane diammoniate (from ammonia-boron trifluoride). The desired products were not obtained from anilinium chloride, ammonium hydrogen sulfate, or several alkyl amine compounds with boron trifluoride. (auth)

3327 CCC-1024-TR-213
Callery Chemical Co., Penna.
CHEMICAL PROPERTIES OF SODIUM TRIETHYLHYDROBORATE AND SODIUM TRIISOPPROPOXYHYDROBORATE. R. K. Pearson and L. J. Edwards — P. M. Maginnity, ed. Dec. 13, 1956. 13p. Contract [NOa(s)-52-1024-c].

Sodium hydride and triethylborane react to form sodium triethylhydroborate, $NaBH(C_2H_5)_3$. This compound, a liquid at room temperature, was found to be soluble in hexane and mineral oil. A study was made of the thermal decomposition of sodium triethylhydroborate and its behavior toward boron trifluoride, boron trichloride, methyl borate, carbon dioxide, silane, and ethylene. Sodium triisopropoxyhydroborate, $NaBH(OC_3H_7)_3$, was prepared and also found to be soluble in hexane and mineral oil. The reactions of this compound with methyl borate, triethylborane, silicon tetrachloride, and boron trichloride were investigated. (auth)

3328 KAPL-1653
Knolls Atomic Power Lab., Schenectady, N. Y.
SOLUBILITY OF SODIUM MONOXIDE IN LIQUID SODIUM. O. N. Salmon and T. J. Cashman, Jr. Nov. 30, 1956. 29p. Contract W-31-109-Eng-52. $0.25(OTS).

The solubility of Na_2O in liquid Na in the temperature range 100 to 500°C has been obtained by analysis of the O_2 content of Na samples taken from liquid Na in equilibrium with excess Na_2O. The method of least squares has been applied to the data to derive the solubility equation $\log_{10} y = -1816/T + 1.266$ in which y is the solubility of Na_2O in Na, expressed as wt. % O_2 in Na, and T is the absolute temperature of the Na in °K. A brief description of corrosion of Type 347 stainless steel specimens by Na saturated with Na_2O at 500°C is also presented. (auth)

3329 ORO-161
Arkansas. Univ., Fayetteville.
THE THERMAL EXCHANGE OF RADIOACTIVE IODINE WITH HYDROGEN IODIDE AND WITH METHYL IODIDE IN THE GAS PHASE (thesis). Henry Schmied. Dec. 1956. 102p. Contract AT(40-1)-277. $16.80(ph OTS); $5.70 (mf OTS).

3330 UCRL-3595
California. Univ., Berkeley. Radiation Lab.
CHEMISTRY DIVISION QUARTERLY REPORT [FOR] JUNE, JULY, AND AUGUST 1956. Oct. 15, 1956. 106p. Contract W-7405-eng-48. $0.55(OTS).

Bio-Organic Chemistry: Studies are reported in C^{14}-ion irradiation of C_6H_6, irradiation of choline analogs, ion-chamber assay of C^{14}, NMR spectroscopy, identification and spin resonance of organic free radical, biochemistry of algae, metabolism, and biosynthesis. Nuclear Chemistry: Investigations into isotopes of Ir, Re, Dy, Pu, U, and Np are reported. New radiation detection and counting devices and techniques are described. Chemical Engineering: Studies are reported in liquid-liquid extraction, extraction equipment, gas-liquid partition chromatography, mass transfer from packed beds into gases, and thermal conductivity of gases at high temperatures. General Chemistry: Work is reported in high temperature thermodynamics of C_2, SiO_2, and MgOH. The chemistry of Ru, kinetics and thermodynamics of I^+, kinetics of rapid reactions, composition of carbide vapors, radioinduced reactions in nonaqueous solutions, F^{19} NMR, AlH_3 structure, heat of formation of aqueous ferrate VI, and acetaldehyde extinction coefficients were also studied. (For preceding period see UCRL-3415.) (T.R.H.)

3331 AEC-tr-2702
NOTE CONCERNING THE STAINING OF ACID MUCOPOLYSACCHARIDES ON PAPER. Heinz Gibian and Jean Barrolier. Translated from Naturwissenschaften 43, 60 (1956). 4p.

3332 AEC-tr-2806
REACTIONS AND EQUILIBRIUMS IN ALKALI HYDROXIDE FUSIONS. II. EXTINCTION MEASUREMENTS AS AN AID IN THE INVESTIGATION OF MANGANATE EQUILIBRIUMS. Hermann Lux and Titus Niedermaier. Translated from Z. anorg. u. allgem. Chem. 285, 246-61(1956). 25p.

In the investigation of equilibriums a process was developed which makes it possible to carry out extinction measurements on corrosive fusions at high temperatures. The light ray in this case permeates two parallel plane boundary surfaces of the liquid and gaseous phases, which are prepared without using a transparent vessel material. The same experimental arrangement in addition makes possible the determination of solubilities at high temperature and can also be found useful in the extreme ranges of the spectrum. The spectral photometric investigation of manganate equilibriums as a function of the partial pressure of oxygen and water vapor in the gaseous phase at 260°, 130° and 410° showed that in NaOH fusions only manganate (V) is stable. In KOH melts on the contrary manganate (V) and manganate (VI) exist together, in which case the fraction of manganate (V) increases with increasing temperature, but decreases with increasing partial pressure of water vapor or oxygen. The relationship which is found thus indicates that the manganate equilibriums which were observed are related to the transition of O_2 into the peroxide ion. (auth)

3333
THE ACTIVITY COEFFICIENT OF NITRIC ACID, A PARTIALLY IONIZED 1:1-ELECTROLYTE. H. A. C. McKay (Atomic Energy Research Establishment, Harwell, Didcot, Berks). Trans. Faraday Soc. 52, 1568-73(1956) Dec.

With the aid of non-thermodynamic data for the degree of dissociation of HNO_3 it is possible to calculate the "true" activity coefficient of fully ionized HNO_3 from the tabulated stoichiometric coefficient. Up to 7 m the curve obtained fits excellently into the family of activity coefficient curves for 1:1-electrolytes. (auth)

3334

SPECTROPHOTOMETRIC STUDIES OF PENTAVALENT VANADIUM AQUEOUS SOLUTIONS. Yu. V. Morachevskiĭ and L. I. Belyaeva (Zhdanov Leningrad State Univ.). Zhur. Analit Khim. 11, 672-7(1956) Nov.-Dec. (In Russian)

Spectrophotometric investigations were made of the pentavalent V aqueous solutions in a wide range of hydrogen ion concentrations (from 6N NaOH up to 10N H_2SO_4). Vanadium salts $VO_2VO_3 \cdot aq.$ were found near the isoelectric point (pH ~ 2), hence the polyvanadium acids previously reported in the literature should be considered the products of molecular association of this salt. It was also found that V polymerization in aqueous solutions begins in 10^{-4} g-at/l. Schemes of various possible transitions between various ionic forms of pentavalent vanadium in aqueous solutions are offered. (R.V.J.)

3335

MONOCRYSTALS OF STRONTIUM TITANATES. A. L. Khodakov et al. (Molotov Inst. of Physico-Mathematical Research Inst.). Zhur. Tekh. Fiz. 26, 2506-7(1956) Nov. (In Russian)

Descriptions are given of the properties and methods of preparation of strontium titanate monocrystals obtained by crystallization from polycrystalline solutions of $SrTiO_3$ in fusion with potassium fluoride and by crystallization from polycrystalline solution of $SrTiO_3$ in fusion with 60% Na_2CO_3 + 40% K_2CO_3. (R.V.J.)

ANALYTICAL PROCEDURES

3336 AERE-C/R-255

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

THE DETERMINATION OF PLATINUM METALS IN ALUMINIUM. F. T. Birks. Sept. 28, 1948. 5p.

The Pt metals are separated from the Al by reduction to metal with Zn in acid solution, using Au as a carrier. The concentrates on Au are examined spectrographically. The limits of detection in parts per million are Pd 1, Rh 5, Ir 4, Pt 5, Ru 5. (auth)

3337 CCC-1024-TR-211

Callery Chemical Co., Penna.

DETERMINATION OF WATER IN BORIC OXIDE. R. C. Morrow, W. C. McGrew, and A. E. Weber — L. S. Stone, ed. Dec. 4, 1956. 9p. Contract [NOa(s)-52-1024-c].

Weighing the water removed by heating boric oxide in vacuo at 250°C appears to be a promising method for determining water in boric oxide. Loss on ignition, hydrogen evolution from lithium aluminum hydride, and measurement of the change in electrical properties are less satisfactory methods studied. (auth)

3338 CCC-1024-TR-212

Northwestern Univ., Evanston, Ill.

GRAVIMETRIC DETERMINATION OF BORON BY PRECIPITATION AS NITRON FLUOROBORATE. C. A. Lucchesi and D. D. DeFord. Dec. 7, 1956. 9p.

A simple gravimetric method for the determination of boric acid in aqueous solution has been developed. The method is based upon the conversion of boric acid to fluoroboric acid and the precipitation of the latter with nitron. Fluoride ion and weak acids and bases do not interfere. Over the range in which the method has been tested, i.e., from 125 to 250 mg of boric acid, the average absolute accuracy for 24 determinations was ±1.1 percent. (auth)

3339 HW-42663(Rev.)

Hanford Atomic Products Operation, Richland, Wash.

DETERMINATION OF GASES IN METALS BY GASOMETRIC METHODS. R. E. Taylor. May 1, 1956. Decl. Nov. 29, 1956. 46p. Contract W-31-109-Eng-52. $0.45(OTS).

The design and operation of a high vacuum system for the analysis of gases (N_2, O_2, and H_2) present in Zr, U, and Pu are described. Vacuum fusion and vacuum extraction results for H_2 normally agree within 5 ppm, and O_2 values are obtained within 10%. (W.L.H.)

3340 HW-45964

Hanford Atomic Products Operation, Richland, Wash.

SPECTROCHEMICAL ANALYSIS OF CESIUM IN HIGH CONCENTRATIONS OF SODIUM AND IRON SALTS. J. M. Taylor. Oct. 9, 1956. 11p. Contract W-31-109-Eng-52. $0.15(OTS).

A rapid spectrochemical method for determining Cs in high concentrations of Fe and Na salts has been developed. Samples are mounted directly on flat-top electrodes, dried, and sparked. Standard deviation is ±2.75%, and the accuracy is within 10% in the range of 10 to 200 ppm Cs. (auth)

3341 NBS-4555

National Bureau of Standards, Washington, D. C.

CHEMICAL ANALYSIS OF BINARY ALLOYS OF PLATINUM AND URANIUM. Martha S. Richmond, John R. Baldwin, and E. June Maienthal. Feb. 1, 1956. 19p. $0.20(OTS).

The analyses of thirty Pt-U alloys containing from 0.2 to 95% of Pt, are described. Detailed procedures and experimental data are included. Platinum is determined by a stannous chloride-spectrophotometric method in the presence of U or by a sulfide-gravimetric method. Provision is made for the separation and/or determination of Cu, W, and U that might contaminate PtS_2 precipitates. After the separation of Pt, U is determined by an alkaline peroxide–spectrophotometric method or by titration with dichromate. (auth)

3342 WADC-TR-55-421

Wright Air Development Center. Materials Lab., Wright-Patterson AFB, Ohio.

COMPARATIVE METHODS OF FLUORINE ANALYSIS. Period Covered: January 1954 to July 1955. Gordon D. Oshesky. Feb. 1956. 63p. Project title: MATERIALS ANALYSIS AND EVALUATION TECHNIQUES. Task title: ORGANIC AND MICROANALYSIS. (PB-121190).

Three methods for analysis of fluoroörganic compounds containing 10 to 70% fluorine for fluorine are described. One involves combustion, hydrolysis, and titration of HF; another is by fusion with K_2CO_3, followed by dissolution, precipitation as PbClF, and gravimetric or titrimetric determination of F_2 or Cl_2; the third is by fusion with K, and titration with $Th(NO_3)_4$. 1508 references. (T.R.H.)

3343 AEC-tr-2809

THE RAPID ESTIMATION OF URANIUM IN SEA AND RIVER WATERS. J. Korkisch, A. Thiard, and F. Hecht. Translated by R. Todd from Mikrochim. Acta, 1422-30 (1956). 8p.

The development of an ion exchange process which allows the direct polarographic determination of U in sea and river waters after a single column operation and without prior evaporation of the aqueous samples or making use of any ether extraction is presented. (J.E.D.)

3344

PRECISION PLATING OF POLONIUM. Isaac Feldman and Margaret Frisch (Univ. of Rochester, N. Y.). Anal. Chem. 28, 2024(1956) Dec.

In order to investigate the physiochemical properties of Po, the best features of published methods of Po plating were combined to obtain single plating recoveries of 99% and better, and an accuracy within the probable counting error and a reproducibility within the pipetting error. (F.S.)

3345
USE OF PHYTIC ACID IN ANALYTICAL CHEMISTRY OF THORIUM. D. I. Ryabchikov, V. K. Belyaeva, and A. N. Ermakov (Vernadskiĭ Moscow Inst. of Geochemistry and Analytical Chemistry). Zhur. Analit. Khim. 11, 658-67 (1956) Nov.-Dec. (In Russian)

Reactions of phytic acid with the majority of inorganic cations were studied and conditions for quantitative recovery of Th by phytic acid precipitation were determined. Calcination of thorium phytinate at 1100° resulted in the residue of $Th(PO_3)_4$. A method for quantitative determination of Th in monazite concentrates by Th precipitation from 6N nitric acid in the presence of oxalic acid has been developed. (R.V.J.)

DEUTERIUM AND DEUTERIUM COMPOUNDS

3346 AECD-3762
[Savannah River Operations Office, AEC].
NOTES ON DEGRADATION OF HEAVY WATER MODERATOR BY ION EXCHANGE BEDS AND METAL SURFACES. [1956]. Decl. Jan. 10, 1957. 2p. $1.80(ph OTS); $1.80 (mf OTS).

Data on the isotopic degradation of D_2O used to deuterize deionizer beds at Savannah River Plant are presented. Also, the extent to which light hydrogen, chemically bound to Al surfaces may degrade D_2O is estimated. (auth)

3347 BNL-107
Brookhaven National Lab., Upton, N. Y.
CHEMICAL EXCHANGE REACTIONS FOR THE PRODUCTION OF HEAVY WATER. Interim Progress Report. Chemistry Dept. Jacob Bigeleisen, Norman Elliott, Lewis Friedman, A. P. Irsa, Arthur Kant, Morris L. Perlman, and Herbert C. Prosser. Apr. 15, 1951. Decl. Nov. 14, 1956. 13p. $3.30(ph OTS); $2.40(mf OTS).

An investigation is being made of the kinetics of the exchange of hydrogen between the elementary gas and liquid ammonia containing dissolved potassium amide. Under the conditions of the experiments the reaction is diffusion-controlled; thus the rate depends on the efficiency of phase contact. Appreciable exchange may be observed in a fraction of a second. The possible use of the hydrogen exchange reaction $HD + NH_3 \rightleftharpoons NH_2D + H_2$ for the industrial concentration of deuterium in a dual temperature plant is discussed in terms of rates and equilibria. Water may be used as a source material. It has been found that hydrogen exchanges rapidly at room temperature between the gas and uranium hydride. A preliminary measurement of the equilibrium shows that this reaction is not suited to the separation of the isotopes of hydrogen. (auth)

3348
RADIATION-INDUCED EXCHANGE OF DEUTERIUM BETWEEN HEAVY WATER AND DISSOLVED HYDROGEN. J. Bardwell and P. J. Dyne. Can. J. Chem. 35, 82-8(1957) Jan.

Exchange of deuterium between deuterium oxide and molecular hydrogen is induced by gamma rays from Co^{60}. The reaction was studied by irradiating heavy water solutions saturated with hydrogen gas, and then analyzing the gas with a mass spectrometer. The reaction rate conforms to the exponential exchange law. The exchange yield is independent of dose rate and of hydrogen concentration over a moderate range. Prolonged irradiation leads to a steady state where the isotopic composition of the gas is close to that of the solution. This state differs greatly from that for thermodynamic equilibrium at room temperature. (auth)

FLUORINE AND FLUORINE COMPOUNDS

3349 AERE-Lib/Trans-821
ON THE POLYMORPHISM OF BERYLLIUM FLUORIDE. D. F. Kirkin, A. V. Novoselova, and Yu. P. Simanov. Translated by S. Botcharsky from Doklady Akad. Nauk S.S.S.R. 107, 837-8(1956). 4p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 10-11106. (W.L.H.)

3350
METHORICS OF THE PRECIPITATION PROCESSES. XIII. STUDY OF THE PRECIPITATION OF SPARINGLY SOLUBLE METAL FLUORIDES. B. Cernicki and B. Tezak (Univ. of Zagreb, Croatia, Yugoslavia). Croat. Chem. Acta 28, 175-9(1956).

The precipitation processes of slightly soluble fluorides were studied tyndallometrically. In the case of CaF_2, MgF_2, and LaF_3 a crystallization maximum appeared in the accessible concentration region, while in the case of ThF_4 two maxima appeared which seemed to be the concentration and the isoelectric ones. The solubility products of the fluorides depended on the sol concentration. (auth)

3351
METHODS OF DETERMINATION OF FLUORIDE CONTENT IN SILICATES. Yu. V. Morachevskiĭ and E. N. Egorova (Inst. of Silicate Chemistry). Izvest. Akad. Nauk S.S.S.R. Otdel. Khim. Nauk 1320-8(1956) Nov. (In Russian)

Refer also to abstract 3342.

GRAPHITE

3352
RATE OF TRANSFORMATION OF RHOMBOHEDRAL GRAPHITE AT HIGH TEMPERATURES. Eitaro Matuyama (Yamaguchi Univ., Ube, Japan). Nature 178, 1459-60(1956)

LABORATORIES AND EQUIPMENT

3353 HW-45149
Hanford Atomic Products Operation, Richland, Wash.
MECHANICAL FEATURES OF A CONTINUOUS ION EXCHANGE UNIT. B. E. Lauer. Aug. 7, 1956. 85p. Contract [W-31-109-Eng-52]. $13.80(ph OTS); $4.80(mf OTS).

A review of continuous countercurrent ion exchangers described in the literature is given. Included are some moving bed processes similar in mechanical arrangement to ion exchangers, and some auxiliary mechanical devices which may be used in an ion exchanger. (T.R.H.)

3354 IDO-14386
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
A MULTICURIE FACILITY FOR HIGH LEVEL CHEMICAL PROCESS RESEARCH. R. D. Fletcher and C. M. Slansky. Sept. 17, 1956. 41p. Contract AT(10-1)-205. $0.30 (OTS).

A multicurie hot cell for high level chemical process research is described. Sixty-inch thick barytes concrete walls provide shielding for 75,000 curies of 1.6-Mev gamma activity. Chemical studies are performed with special remote equipment and a pair of Argonne Model 8 master slave manipulators with direct viewing through five feet of 3.2-density laminated glass windows. (auth)

3355
DRY-WAY FLUORINATION UNDER GLOVEBOX CONDITIONS. K. R. Hyde and D. J. O'Connor (Atomic Energy Research Establishment, Harwell, Berks, England).

Nucleonics 15, No. 1, 68-71(1957) Jan.

An apparatus is described for the hydrofluorination and fluorination of irradiated U and Th systems containing up to 2 curies of α and mixed fission product (β,γ) activities. (W.L.H.)

MOLECULAR STRUCTURE

3356 UCRL-3531

California. Univ., Berkeley. Radiation Lab.

CHEMISTRY AND SPIN-RESONANCE SPECTROSCOPY OF RADICALS FROM THIOAROMATIC COMPOUNDS. Antonino Fava, Power B. Sogo, and Melvin Calvin. Nov. 1, 1956. 16p. Contract W-7405-eng-48. $0.20(OTS).

The deeply colored solutions that result when a wide variety of aromatic sulfides are dissolved in concentrated H_2SO_4 are shown to contain free radicals having the thianthrene nucleus. These result from the condensing and oxidizing properties of concentrated H_2SO_4. A simplified system in trifluoroacetic acid has been studied in detail, and the radical has been shown to have an oxidation level lying between the monoxide and dioxide of thianthrene. An interpretation of the spin-resonance spectrum permits a choice of a specific radical structure. (auth)

RADIATION EFFECTS

3357

THE PARASITE REACTOR, A PRESSURE-BOMB ASSEMBLY FOR PHASE STUDIES UNDER IRRADIATION. Richard M. Bidwell and Walter R. Wykoff (Los Alamos Scientific Lab., N. Mex.). Nuclear Sci. and Eng. 1, 443-51 (1956) Dec.

The Parasite Reactor is a 1-liter pressure bomb for phase studies under irradiation at temperatures and pressures up to at least 400°C and 5000 psi. Provision was made for sampling of solid, liquid, and gas phases for analysis. Power output was measured. Yields of radiolytic gases were calculated. It was established that $UO_2(NO_3)_2$ solutions are sufficiently stable up to 248°C to be used for a proposed high-pressure Water Boiler reactor. (auth)

3358

IRRADIATION OF PLASTICS. David S. Ballantine (Brookhaven National Lab., Upton, N. Y.). SPE Journal 12, No. 7, 27-31(1956) July.

A review of investigations of chemical reaction mechanisms resulting from irradiation of plastics and polymers is presented. (T.R.H.)

RARE EARTHS AND RARE-EARTH COMPOUNDS

Refer to abstract 3391.

SEPARATION PROCEDURES

3359 CF-56-9-25

Oak Ridge National Lab., Tenn.

RAW MATERIALS PROCESS TESTING. Engineering Section Progress Report [for] May 1956. A. D. Ryon and K. O. Johnsson. Sept. 6, 1956. 16p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The density, viscosity, and interfacial tension were determined for the aqueous and organic phases in the Amex and Dapex processes to aid in correlation of experimental data. Tests have been made on a few materials of construction to determine their resistance to chemical attack by the organic phases. (W.L.H.)

3360 HW-40820

[Hanford Atomic Products Operation, Richland, Wash.]

THE FLAMMABILITY OF VAPORS ABOVE PUREX SYSTEMS. L. L. Burger. Jan. 9, 1956. 10p. $1.80(ph OTS); $1.80(mf OTS).

3361 ORNL-2172

Oak Ridge National Lab., Tenn.

FURTHER STUDIES OF THE DIALKYLPHOSPHORIC ACID EXTRACTION (DAPEX) PROCESS FOR URANIUM. Progress Report. C. A. Blake, D. J. Crouse, C. F. Coleman, K. B. Brown, and A. D. Kelmers. Jan. 23, 1957. 115p. Contract W-7405-eng-26. $0.65(OTS).

Progress is reported on certain aspects of the Dapex Process, including further study of miscibility modifiers for the kerosene diluent, synergistic extractant combinations, stripping of extracted U, and continuous countercurrent demonstration on actual plant liquors. (auth)

3362 ORNL-2173

Oak Ridge National Lab., Tenn.

PROGRESS REPORT ON SEPARATION AND RECOVERY OF URANIUM AND THORIUM FROM SULFATE LIQUORS BY THE AMEX PROCESS. D. J. Crouse, K. B. Brown, and W. D. Arnold. Jan. 11, 1957. 40p. Contract W-7405-eng-26. $0.30(OTS).

The amine extraction Process can be used effectively for the extraction and separation of U and Th from sulfate liquors in which these metals co-exist. With proper choice of reagents, either U or Th can be extracted first and the other extracted in a second cycle. Reagent costs are estimated to be low for both the U and Th recovery cycles. (auth)

3363 WIN-59

National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass.

LABORATORY INVESTIGATION OF E. L. CORD SAMPLE. E. S. Porter and H. I. Viklund. Jan. 14, 1957. 18p. Contract AT(49-6)-924. $3.30(ph OTS); $2.40(mf OTS).

3364 TIL/T4601

INVESTIGATION INTO MULTIPLE FLUIDISED BEDS. THE FLUIDISATION OF PARTICLES INSIDE THE DOWNSPOUT. S. Yagi and I. Muchi. Translated from Chem. Eng. (Japan) 19, 155-61(1955). 9p. (AD-103012).

In these multiple fluidized bed studies boundary conditions for slugging in the beds and downspout, for particle supply, and for downspout closing due to excessive particle corpuscularity are determined. Basic data for designing multiple fluidized beds are obtained. (T.R.H.)

3365

CATHODE PROCESSES IN ELECTROLYTIC PRECIPITATION OF THORIUM. M. V. Smirnov and L. D. Yushina (Ural Acad. of Science). Izvest. Akad. Nauk S.S.S.R. Otdel. Khim. Nauk 1285-93(1956) Nov. (In Russian)

Studies were made of molybdenum cathode polarization processes in molten eutectic mixtures of Li and K chlorides containing 0.18, 2.6, and 27.8 wt. % $ThCl_4$ and 2.2 and 2.0 wt. % ThF_4 in the wide range of current density from 10^{-3} to 4 A/cm^2 at temperatures from 600 to 800°. (R.V.J.)

3366

SEPARATION OF ZIRCONIUM AND HAFNIUM. L. N. Komissarova and V. E. Plyushchev. Uspekhi Khim. 25, 1197-1222(1956) Oct. (In Russian)

A review is given of various uses and applications for pure Zr and Hf. Fractional crystallization of the complex, fractional precipitation, thermal separation, sublimation and distillations of halogenites, adsorption and ionic exchange, and extraction methods for zirconium–hafnium separation are discussed. 123 references. (R.V.J.)

3367

PROGRESS IN NUCLEAR ENERGY. SERIES III. PROCESS CHEMISTRY. F. R. Bruce, J. M. Fletcher, H. H. Hyman, and J. J. Katz, eds. New York, McGraw-Hill Book Co., Inc. and London, Pergamon Press Ltd., 1956. 416p.

The papers presented deal with U, Pu, and Th. The recovery of U and Th from their ores and important aspects of the chemical processing of these elements in connection with reactor operation are covered. Some attention is devoted to methods for fission product recovery. (W.L.H.)

Refer also to abstract 3396.

SYNTHESES

3368 NP-6169

University of Southern Calif., Los Angeles.

STUDIES ON BORON HYDRIDES. Tenth Annual Technical Report of INVESTIGATIONS ON WATER-REACTIVE CHEMICAL COMPOUNDS. Anton B. Burg. Nov. 1, 1956. 48p. Project NR-052-050. Contract N6onr-238-TO-I.

The reaction and structure of boron hydrides with various organic compounds are discussed. (W.L.H.)

3369 WADC-TR-53-426(Pt. 4)

Iowa State Coll., Ames.

ORGANO-METALLIC AND ORGANO-METALLOIDAL HIGH-TEMPERATURE LUBRICANTS AND RELATED MATERIALS. Henry Gilman and Richard D. Gorsich. Nov. 2, 1956. 62p. Project title: RUBBER, PLASTIC, AND COMPOSITE MATERIALS. Task title: SYNTHESIS AND EVALUATION OF NEW POLYMERS. Contract AF33(616)-3510.

This project is concerned primarily with the synthesis of new compounds to be examined as potential hydraulic fluids and lubricants. The synthesis and preliminary screening of organo-metallic and organo-metalloidal compounds has been extended. New cyclic compounds continue to be promising. It has also been found that the meta-biphenylyl group can be added to those groups which impart desirable physical characteristics. The methyldibenzylsilylmethyl group is also of significant promise. In the experimental part, there is included a table which outlines the preliminary screening of thirty-six compounds. (auth)

3370 WADC-TR-54-532(Pt. 3)

Monsanto Chemical Co., Dayton, Ohio.

HIGH-TEMPERATURE HYDRAULIC FLUIDS. PART 3. DEVELOPMENT OF AROMATIC ETHERS AS BASE STOCK. Period covered: July 1955 through July 1956. Edward S. Blake, James W. Edwards, William C. Hammann, and Thomas Reichard. July 1956. 97p. Project title: RUBBER, PLASTIC AND COMPOSITE MATERIALS. Task title: SYNTHESIS AND EVALUATION OF NEW POLYMERS. Contract AF33(616)-2623.

Over fifty alkyl-substituted and unsubstituted aromatic ethers have been synthesized, many of which are new compounds. The melting point, pour point, vapor pressure, viscosity, and thermal stability of most of these ethers have been measured from which correlations have been made by which the boiling point, 210°F viscosity and 210 to 400°F ASTM slope, and thermal stability of a new ether can be predicted. From the data at hand it should be possible to synthesize aromatic ethers stable to 700°F, liquid at 0°F, viscosity <550 cs at 32°F and with a vapor pressure <600 mm/700°F. (auth)

TRANSURANIC ELEMENTS AND COMPOUNDS

3371

ALPHA DECAY OF Np^{237}. L. N. Kondrat'ev, G. I. Novikova, A. M. Vorob'ev, and L. L. Gol'din. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 875-6(1956) Aug. (In Russian)

Alpha spectra of Np^{237} were studied and compared to the spectra of Am^{241}. The purified specimen did not contain over 0.02% by weight of Pu^{239} and the total sum of other impurities was reduced to 0.01%. The measurements were carried out with a magnetic α spectrometer. The diagram is given for the Np^{237} α spectra in the range of 4.8 Mev, and the results of measurements made of Np^{237} α spectra are tabulated. The comparison of α spectra of Np^{237} and Am^{241} revealed that at the second level transitions the intensities of the main α particles correspond. In first-level transitions of Np^{237} α spectra, the order of intensities was higher than in Am^{241}. While in Am^{241} α decay the highest intensity order occurs at the principal level of the wide rotation band, there were no indications of the rotating origin of excitations as in Np^{237} spectra. This fact was quite unexpected for such a heavy nucleus as Np^{237} (R.V.J.)

URANIUM AND URANIUM COMPOUNDS

3372 AERE-C/M-292

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

NOTES ON SOME BINARY SYSTEMS CONTAINING URANIUM TRIFLUORIDE. R. W. M. D'Eye and F. S. Martin. Nov. 19, 1956. 4p.

Some UF_3 systems have been investigated by x-ray-diffraction with the following results: A compound Na_2UF_5 is formed with NaF. There is no compound formation or solid solubility in the system UF_3-BaCl_2. Solid solutions are formed in the system UF_3-BaF_2 and $-SrF_2$. There is no solid solution of UF_4 in UF_3 but there may be slight solubility of UF_3 in UF_4. The melting point of $BaCl_2$ is depressed whereas that of BaF_2 is increased by the addition of UF_3. (auth)

3373 IGR-R/R-198

Gt. Brit. Dept. of Atomic Energy. Industrial Group H. Q., Risley, Lancs, England.

PLASTIC FLOW AND THE SWELLING OF GAS BUBBLES IN URANIUM. J. A. Enderby. Nov. 1956. 18p.

For high rates of irradiation a modified theory gives an appreciably higher swelling rate for U than Foreman's theory. At low irradiation rates, however, plastic flow makes a negligible contribution to the swelling although the deviation from the gas laws still adds ~1% to the swelling for 1% burn-up. When the swelling is as great as 10% this is not very important and so the modification of Foreman's theory does not remove the discrepancy between theory and experiment reported for irradiation at 600°C. (auth)

3374

URANIUM RECOVERY FROM SALINE SOLUTIONS BY BIOLOGICAL SLIMES. Earnest F. Gloyna and Ben B. Ewing (Sanitary Engineering, Univ. of Texas, Austin). Nucleonics 15, No. 1, 78-81(1957) Jan.

The factors affecting the biological concentration of U by bacterial suspensions include: pH, length of aeration period, contact time, methods of mixing, stage of organism growth, condition of sludges, and optimum U dosage for maximum uptake. (W.L.H.)

WASTE DISPOSAL

3375 CRLR-648

Chemical and Radiological Labs., Army Chemical Center, Md.

A SURVEY OF RADIOACTIVE WASTE DISPOSAL. Fritz A. Hedman. Mar. 1, 1956. 15p. Project 4-12-10-007-04.

A survey was made of directives and information relative

to handling and disposal of radioactive wastes. Data are summarized. (C.H.)

3376

LIQUID AND GASEOUS EFFLUENT DISPOSAL–1. F. R. Farmer (U.K.A.E.A. Industrial Group H.Q., Risley). Atomics 8, 25-7(1957) Jan.

The article reviews the many aspects of the radioactive-effluent problem at the Windscale Works of the U.K.A.E.A. The experience gained as a result of 4 years' operation provides the first practical data on the release of radioactivity from industrial plant. (auth)

3377

ECONOMICS OF WASTE DISPOSAL. H. R. Zeitlin, E. D. Arnold, and J. W. Ullmann (Chemical Tech. Div., Oak Ridge National Lab., Oak Ridge, Tenn.). Nucleonics 15, No. 1, 58-62(1957) Jan.

Based on a predicted nuclear power economy growth rate, calculations have been made to determine as a function of time the magnitude of several quantities important to the radiochemical-processing and waste-disposal industries. These quantities include required processing capacity, buildup of fission products, and accumulation of liquid wastes. (W.L.H.)

ENGINEERING

3378 HW-45918

[Hanford Atomic Products Operation, Richland, Wash.]

PULSE TRANSMISSION TO A PULSE COLUMN. C. Groot and V. R. Cooper. [1956?]. 12p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

In the countercurrent liquid-liquid extractor of Van Dijck (U.S. 2,011,186) pulses of fluid originate in a pulse pump and pass through a transmission line to the column. The minimum pressure developed in this line by the momentum of the pulsing fluid is P min. = $-2\pi^2 kl\rho\omega^2/Ag$ where k is the displacement of the pulse pump, l is the length of the transmission line, ω is the pulse frequency, A is the cross-sectional area of the pulse transmission line, and g is the acceleration of gravity. The equation is derived from fundamental consideration and shown to work in practice. (auth)

3379 IDO-16086

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

DESIGN FEATURES OF THE MTR UNDERWATER CUTTING SAW. R. I. Kuehl. Mar. 16, 1953. Decl. May 18, 1955. 7p. Contract [AT(10-1)-205]. $1.80(ph OTS); $1.80(mf OTS).

A record of design changes made on an existing saw to serve as a guide in future design of mechanical underwater cutting apparatus is made. Where bulk water shielding is employed, a remotely driven ordinary hack saw has proved to be a successful method for cutting metal objects. (auth)

3380 WAPD-AD(RM)-18

[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh].

FRICTION COEFFICIENT VARIATION IN ROOM TEMPERATURE WATER. N. B. Dewees. Apr. 6, 1955. 13p. $3.30(ph OTS); $2.40(mf OTS).

Simple laboratory tests in which substantial variations in friction were reproduced in continuous operation, passage of time without mechanism operation, disassembly and reassembly, assembly with different parts and contamination with handling. All tests were in deionized clean water at room temperature, exposed to the atmosphere. The coefficient of friction is not a single value but a range of values dependent upon conditions not wholly within the designer's control. (F.S.)

HEAT TRANSFER AND FLUID FLOW

3381 HW-41295

Hanford Atomic Products Operation, Richland, Wash.

THE RESULTS OF THE D-12 BOIL UP TEST AND RECOMMENDATIONS TO IMPROVE THE PERFORMANCE OF BAYONET TUBE BUNDLES. M. W. Cook. Feb. 7, 1956. 37p. $6.30(ph OTS); $3.00(mf OTS).

Tests performed on the D-12 Redox waste evaporator for evaluation of the bayonet tube bundles as removable expendable heat transfer surfaces are reported. To overcome the difficulty encountered in the production of secondary steam in the condensate a D-11 condenser was designed and tested. (F.S.)

3382 KAPL-M-RES-33

Knolls Atomic Power Lab., Schenectady, N. Y.

HEAT TRANSFER COEFFICIENTS DURING TRANSIENTS. H. F. Larkin. Nov. 15, 1956. 9p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

The heat transfer coefficient with an increasing surface heat flux and constant fluid boundary layer is always higher than the steady state heat transfer coefficient, therefore, it is conservative to neglect the variation. In any event the response time of the heat transfer coefficient development to transient conditions is very small when compared with the fuel element response time. With decreasing flow the hydraulic boundary layer thickness increase tends to slightly lag the flow decrease, therefore, it is conservative to assume that the heat transfer coefficient varies directly as the flow. (auth)

3383 KAPL-M-WEJ-3

Knolls Atomic Power Lab., Schenectady, N. Y.

TRANSIENT THERMAL STRESSES IN THIN-WALLED CYLINDERS. SIR MECHANICAL ENGINEERING ANALYSIS. W. E. Jahsman. Oct. 12, 1956. 41p. Contract W-31-109-Eng-52. $6.30(ph OTS); $3.00(mf OTS).

Using experimental data showing the time behavior of temperatures at various depths in the thin wall of a cylindrical pipe whose exterior is insulated and whose interior is repeatedly thermally shocked by a liquid Na stream, it is possible to predict the surface temperature transient analytically by representing it by a series of straight lines. Once the transient temperature distribution across the wall thickness is known, the time at which the surface temperature deviates most from the mean wall temperature can be obtained. The temperature distribution at this time of maximum deviation has importance because it can be used to determine the maximum surface thermal stress. Plasticity theory is used for the stress calculations because results by elastic theory show that maximum thermal stresses exceed the yield strength of the pipe material, AISI 347 stainless steel. Transforming the thermal strains associated with the calculated stresses into equivalent uniaxial strains, it is found that the thermal shock test results do not contradict any of the existing strain fatigue data for the material. (auth)

3384

HEAT CONDUCTION THROUGH INSULATING SUPPORTS IN VERY LOW TEMPERATURE EQUIPMENT. R. P. Mikesell and R. B. Scott. J. Research Natl. Bur. Standards 57, 371-8(1956) Dec.

An apparatus is described that is used to measure the heat conduction through insulating supports of storage vessels for cryogenic liquids and presents the data obtained from the conduction measurements. Two types of supports were tested: multiple-contact supports in the form of stacks

of thin metallic plates or spirally wound strips, and nonmetallic spheres. The high thermal resistance of the multiple-contact supports arises from the numerous relatively poor contacts between the individual plates. Some special treatments of the plates were tried, and two of these, perforating and dusting, were found to be effective. Pyrex-glass spheres were also found to be excellent insulators, but, of course, are not as rugged as a stack of metal plates. Of the untreated plates tested, those of stainless steel (0.0008 in. thick) were found to be the best insulators per unit length of stack. The heat conduction through these plates, at a load pressure of 1,000 psi, was found to be 2% of the conduction by a solid sample of the same metal having the same dimensions. (auth)

MATERIALS TESTING

3385 WADC-TR-54-451(Pt. 1)
Tour (Sam) and Co., Inc., New York.
EVALUATION OF SURFACE TREATMENTS FOR LOW-ALLOY STEELS. PART 1. TEST METHOD FOR HEAT-RESISTANT CORROSION PROTECTIVE COATINGS ON STEEL. Final Summary Report [for] May 1953 to June 1954. Sam Tour. Nov. 1954. 28p. Project title: METALLIC MATERIALS. Task title: HIGH TEMPERATURE ALLOYS. Contract AF33(616)-406. (AD-61813)

3386 WADC-TR-54-451(Pt. 2)
Tour (Sam) and Co., Inc., New York.
EVALUATION OF SURFACE TREATMENTS FOR LOW ALLOY STEELS. PART 2. PAINT CHROMIZING, PAINT SILICONIZING, AND COATING OF TITANIUM–BORON LOW ALLOY STEEL. Sam Tour. Nov. 1954. 19p. Project title: [METALLIC MATERIALS]. Task title: [HIGH TEMPERATURE ALLOYS]. Contract AF33(616)-406. (AD-58608).

Refer also to abstract 3437.

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

3387 AD-92001
Linden Labs., Inc., State College, Penna.
STUDY OF THE DEGRADATION OF HIGH K CERAMIC DIELECTRICS. Quarterly Report No. 11. W. R. Buessem, P. A. Marshall, Jr., and W. A. Weyl. Dec. 15, 1955. 77p. Contract DA-36-039-SC-42679.

Ceramic dielectric materials suitable for use as capacitors were subjected to 300,000 min of working stresses from 30 to 60 v/mil at 150°C. The materials studied were TiO_2 and TiO_2 with Fe_2O_3, Cr_2O_3, Al_2O_3, $Fe_2O_3 + UO_3$, and UO_3. The tests were interrupted because of silver creep, not bulk breakdown. (T.R.H.)

3388 NACA-RM-E50G21
Lewis Flight Propulsion Lab., Cleveland.
SOME PROPERTIES OF BERYLLIUM OXIDE AND BERYLLIUM OXIDE–COLUMBIUM CERAMALS. C. F. Robards and J. J. Gangler. Mar. 2, 1951. 18p.

Because of the potentially excellent refractory properties of BeO, a brief investigation was made of its short-time tensile strength at a temperature of 1800°F and relative thermal-shock resistance from temperatures of 1800 and 2000°F to room temperature. The effect of additions of 2, 5, 8, 10, 12, and 15% by weight of Nb metal on the thermal-shock resistance of BeO was studied. Metallographic examination indicated that the metallic phase coalesced into pockets. Beryllium oxide had a tensile strength as high as 6160 psi at 1800°F. The original Nb underwent a phase change, as indicated by x-ray analysis of the ceramals. The addition of Nb up to 15 wt. % failed to improve the resistance to thermal shock. The phase change and the failure of the Nb to wet the BeO may explain the poor thermal shock resistance of these ceramals. (auth)

3389 NP-6166
Schwarzkofp Development Corp., Yonkers, N. Y.
HALL CONSTANT AND MAGNETIC SUSCEPTIBILITY OF TRANSITION METAL BIBORIDES. Final Report [for] October 1, 1954 to September 30, 1956. Zoltan Rieder. 68p. Contract Nonr-1538(00).

Measurements have been performed of the electrical resistivity, Hall constant, and magnetic susceptibility of the following transition metal borides: TiB_2, VB_2, CrB, CrB_2, ZrB_2, NbB_2, MoB, Mo_2B_5, TaB_2, W_2B_5, and the solid solutions, TiB_2-VB_2, VB_2-CrB_2, TiB_2-CrB_2, $(TiAl)B_2$, TiB_2-Al, $TiB_2-Al + 2B$, ZrB_2-NbB_2, ZrB_2-MoB_2, and ZrB_2-TaB_2. (W.L.H.)

3390 UCRL-3602
California. Univ., Berkeley. Radiation Lab.
CRYSTAL STRUCTURES OF TRANSITION METAL SILICIDES. Carol H. Dauben. Oct. 1956. 8p. Contract W-7405-eng-48. $0.15(OTS).

Tables are presented in which are listed the phases which have been reported for the silicides of Ti, Zr, V, Nb, Ta, Cr, Mo, and W. Their ideal structure type, lattice constants, space groups, parameters of one of the type, and references are tabulated. (auth)

3391
CERAMIC PROPERTIES OF SAMARIUM OXIDE AND GADOLINIUM OXIDE; X-RAY STUDIES OF OTHER RARE-EARTH OXIDES AND SOME COMPOUNDS. C. E. Curtis and J. R. Johnson (Oak Ridge National Lab., Tenn.). J. Am. Ceram. Soc. 40, 15-19(1957) Jan.

Samarium oxide forms a ceramic of medium strength and density (6.0) when it is fired at 1300°C. When it is fired at 1500°C, its density is increased to 7.4 but it loses its stability toward boiling water. X-ray data are given concerning the structure of the oxide as received and at 1300°C and of the reaction product of Sm_2O_3 with water. Gadolinium oxide forms a ceramic of somewhat higher density (7.0) at 1300° than does Sm_2O_3; at 1500°C its density is slightly higher (7.6) whereas its stability toward water is unchanged. Data concerning both oxides include density, shrinkage, moduli of elasticity and of rupture, linear thermal expansion, differential thermal analysis, and specific heat as well as x-ray data. Results are given of a brief survey of the reaction products obtained when Sm_2O_3 and Gd_2O_3 are heated at 1500°C in equimolecular quantities with Al_2O_3, BaO, CaO, CdO, Fe_2O_3, HfO_2, MgO, SiO_2, SrO, ThO_2, and ZrO_2. X-ray data for the following rare-earth oxides are received and after calcination at 1400°C are given: ceria, praseodymia, neodymia, europia, dysprosia, holmia, erbia, thulia, and ytterbia. (auth)

3392
NEUTRON DIFRACTION OBSERVATION OF HEAT TREATMENT IN COBALT FERRITE. E. Prince (Bell Telephone Labs., Murray Hill, N. J.). Phys. Rev. 102, 674-6(1956) May 1.

The effect on cobalt ferrite of heat treatment in a magnetic field has been studied by neutron diffraction. The data indicate that the magnetic moments are, in general, displaced from the directions which would be expected from considera-

tion of crystalline anisotropy alone. The effect is greater in ferrites that are iron rich than it is in stoichiometric ferrites. The results are consistent with magnetic data. (auth)

CORROSION

3393 AECU-3386

Case Inst. of Tech., Cleveland.

SCALING OF ZIRCONIUM AT ELEVATED TEMPERATURES. Technical Progress Report No. 3. Dept. of Metallurgical Engineering. E. B. Evans and W. M. Baldwin, Jr. Dec. 1956. 32p. Contract AT(11-1)-258. $6.30(ph OTS); $3.00(mf OTS).

To obtain a clearer understanding of the scaling mechanism, additional studies were conducted on the effect of metal purity, specimen thickness and specimen shape on the magnitude of growth; the distribution of the gas to scale and to metal during scaling in various atmospheres; and the course of scaling (instantaneous scaling rates) in transferring from one atmosphere to another. In addition, a mechanism is proposed to fit the known facts concerning the scaling behavior of Zr. The procedures employed are given in detail in the first technical report. (auth)

3394 AGC-AE-29

Aerojet General Corp., Azusa, Calif.

THE REACTION OF MOLTEN METAL WITH WATER. Monthly Progress Report [for] November 1 through November 30, 1956. Jan. 3, 1957. 12p. Contract AT(04-3)-44. $3.30(ph OTS); $2.40(mf OTS).

Tests have been performed to determine the reactivity of molten Zr with water, at temperatures of 2075 to 2565°C. Experiments on the corrosion rate of Zircaloy-2 in steam were completed. (W.L.H.)

3395 CF-57-1-51

Oak Ridge National Lab., Tenn.

EXAMINATION OF 6" DIAMETER "O" RING FROM HRT MOCKUP. Metallography Report (Y-12) No. 39. T. M. Kegley, Jr. Jan. 15, 1957. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

A six-inch diameter "O" ring from the HRT Mockup was examined metallographically after 2452 hrs exposure to uranyl sulfate solution at 300°C. Surface defects, except for cold work defects were found only in areas exposed to uranyl sulfates. Defects found were pits, transgranular cracks, surface cracks, and grain attacks. (F.S.)

3396 HW-32642

Hanford Atomic Products Operation, Richland, Wash.

EXAMINATION OF REMOVABLE TUBE BUNDLES FOR REDOX. K. L. Sanborn and W. R. Smith. Sept. 2, 1954. Changed from OFFICIAL USE ONLY Jan. 11, 1957. 28p. Contract [W-31-109-Eng-52]. $4.80(ph OTS); $2.70(mf OTS).

Metallurgical examination of tube bundles for Redox reveals that the solution heat treatment and quenching operations did not prevent intergranular corrosion. The heat treatment caused distortion. Recommendations which should reduce or prevent these defects are made. (T.R.H.)

3397 KAPL-M-AME-2

Knolls Atomic Power Lab., Schenectady, N. Y.

SURFACE FINISH DETERMINATION ON PITTED SPECIMENS. Charles W. Donnelly. Dec. 27, 1956. 11p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

Upon examination of test section elements, it was observed that there were two distinct types of surface finish present; either a machined surface or a pitted surface. Standard profilimeter measurements of the two surfaces showed no significant difference in value. A method was developed to measure the number of pits per square inch, the depth, diameter and distribution of the pits in the elements. The method consists of a modified zyglo fluorescent dye penetrant technique combined with photo optical procedures. The method yields results which permit direct comparison of the elements tested. (auth)

3398 NP-6178

Mine Safety Appliances Co., Callery, Penna.

A STUDY OF NITROGEN AS A COVER GAS IN SODIUM SYSTEMS. Technical Report No. 53. E. F. Batutis, C. A. Palladino, R. Gagne, and J. W. Mausteller. Dec. 7, 1956. 25p. Contract NObs-65426.

Nitrogen used as a cover gas in several MSA Na systems, ranging from 900 to 1100°F and 1 to 7 fps, did not induce excessive corrosion of Types 304 and 347 stainless steel and tool steel specimens. Average corrosion rates found of the stainless steels ranged from +0.01 to +0.23 mg/cm^2-mo and tool steel ranged from -0.24 to -0.96 mg/cm^2-mo. The corrosion rate of Be in a 1100°F Na system (S2G mock-up) for six specimens exposed for 90 days averaged 1.27 mg/cm^2-mo. This rate of Be attack may be undesirable in some applications and would require definite consideration in design work. Factors affecting Be attack to varied degrees were: entrained N, Ca content, temperature and distance to Na-N interface. The order of magnitude of these factors was not definite but the last mentioned seemed to be least effective. These factors were negligible in the corrosion of stainless steels and tool steel in the MSA test systems. (auth)

3399 ORNL-681

Oak Ridge National Lab., Tenn.

THE CORROSION OF 356 ALUMINUM IN SIMULATED COOLING WATER FOR THE PROPOSED MATERIALS TESTING REACTOR. James L. English. July 20, 1950. Decl. Dec. 27, 1956. 107p. Contract W-7405-eng-26. $16.80(ph OTS); $5.70(mf OTS).

Corrosion behavior of 356 Al was investigated. Corrosion of the uncoupled alloy in demineralized H_2O containing small amounts of H_2O_2, pH 5.5 to 6.5, at 85°C, as well as couples with 2S Al, 43 Al, extruded Be and 347 stainless steel was studied. Corrosion inhibitors tested were Na_2CrO_4 and $Na_2Cr_2O_7$. (T.R.H.)

3400 WAPD-CPM-3

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.

FRETTING WEAR OF ZIRCALOY-2 PELLETS AND CONSEQUENCES THEREOF. Louis A. Waldman and Paul Cohen. Jan. 9, 1956. 22p. Project 55b12. Contract AT-11-1-GEN-14. $4.80(ph OTS); $2.70(mf OTS).

Because results of earlier, short-term tests conducted to determine fretting wear rates in a packed bed of Zircaloy pellets were inconclusive, a new test was designed and conducted in which significant fretting wear rates were traced by using irradiated pellets. The results of this test were combined with observations from the earlier tests and an analysis made of two hazards associated with the operation of a packed bed reactor as consequences of fretting wear: cladding penetration and Zr^{95} activity release. The analysis shows that neither of these hazards is seriously affected by fretting wear. (auth)

3401

PROTECTING MOLYBDENUM AT HIGH TEMPERATURES. Julius J. Harwood (Office of Naval Research). Materials & Methods (1956) Dec.

New coating developments to prevent oxidation of Mo at high temperatures included electrodeposition of Cr and Ni, application of sprayed coatings for protection from 2000 to 2400°F and ceramic and $MoSi_2$ coatings for higher temperatures. (auth)

GEOLOGY AND MINERALOGY

3402 RME-2039(Pt. 1)
Salt Lake Area Office, AEC.
PRELIMINARY REPORT ON THE BUCKHORN CLAIMS, WASHOE COUNTY, NEVADA AND LASSEN COUNTY, CALIFORNIA. PART I. Donald L. Hetland. Aug. 1955. 12p., 1 illus. $0.20(OTS).

The Buckhorn group of mining claims contain secondary U minerals occurring along narrow silicified northeast-trending fractures in Tertiary volcanics of rhyolitic composition. Two zones containing U minerals are present. A thick bed of volcanic tuff separates these two zones stratigraphically. Several other U occurrences have been discovered in Tertiary volcanics in the general area. (auth)

3403 RME-2052
Salt Lake Area Office, AEC.
URANIUM OCCURRENCE NEAR PANACA, LINCOLN COUNTY, NEVADA. Bert L. Myerson. May 1956. 12p. $0.15(OTS).

Carnotite was found in a carbonaceous layer 0.5 to 2.0 ft thick in the late Pliocene or early Pleistocene Panaca tuff near Panaca in Lincoln Co., Nev Some investigative drilling was done to aid in the study of a small, low-grade uraniferous zone. Assays range from 0.004 to 0.12% U_3O_8 and average about 0.05% U_3O_8. Meteoric or warm spring waters percolating through the tuffaceous rocks of this formation may have mobilized U ions already present and reconcentrated them in a more favorable horizon. (auth)

3404 RME-3115
Bureau of Mines and Geological Survey.
MONAZITE PLACERS ON SOUTH MUDDY CREEK, McDOWELL COUNTY AND SILVER CREEK, BURKE COUNTY, NORTH CAROLINA. L[eland] A. Hansen and A. M. White. Mar. 1954. 28p. $0.25(OTS).

South Muddy Creek heads in the South Mountains in McDowell Co., N. C. The flood plains in the reserve area receive drainage from about 18 square miles underlain by deeply weathered gneiss, schist, and granite. Silver Creek rises on the northern flank of the South Mountains in Burke Co., N. C. The flood plains in the reserve area receive drainage from 24 square miles underlain by gneiss, schist, and granite largely weathered to saprolite. Since the two areas are adjacent and similar in most respects, they are included in one report. A total of 15 holes was drilled; eleven on South Muddy Creek for a total of 223 ft, and four on Silver Creek for 90 ft. The reserve area on South Muddy Creek contains approximately 19 million yd^3 of minable gravel in the flood plains. The area of indicated and inferred reserves is divided into sections. Indicated by 11 drill holes are 4,800,000 yd^3 of minable alluvium containing 0.64 lb of monazite and about 5 cents in gold per yd^3. The inferred reserves are 14,200,000 yd^3 containing 0.6 lb of monazite and 3 to 5 cents in gold per yd^3. Indicated monazite reserves are 1,550 tons and inferred reserves 4,250 tons, for a total monazite reserve of about 5,800 tons. Similar areas on Silver Creek contain 20 million yd^3. Indicated by 4 drill holes are 2,200,000 yd^3 containing 0.83 lb of monazite and about 4 cents in gold per yd^3. Inferred reserves are 17,800,000 yd^3 containing 0.6 lb of monazite and 2 to 4 cents in gold per yd^3. Indicated monazite reserves are 900 tons and inferred reserves are 5,350 tons for a total monazite reserve of about 6,250 tons. A brief summary of some churn drill exploration on the Catawba River, Burke Co., N. C. is appended. (auth)

3405 RME-3141
Amherst [Coll.], Mass.
RECONNAISSANCE FOR URANIUM IN THE PHOSPHORIA FORMATION. George W. Bain. June 1956. 64p. $0.40 (OTS).

A general reconnaissance of the literature, field occurrence of U in pelletal phosphates, and development of laboratory study techniques, insofar as these apply to U in the Phosphoria Formation, was undertaken in order to facilitate assessment of potential to this U carrier. The literature placed the most favorable U area in the vicinity of Montpelier (Idaho) with extensions for fifteen miles northward and southward but with both per cent and total volume declining outside these limits and also to eastward and to westward. This favored domain appeared to be a water depth zone, about the bottom of ocean wave disturbance, near a Permian sea margin. Sampling of a variety of structures in the field disclosed that depletion of U content was about in proportion to rock penetration combined with surface presented for interaction by groundwater. Occurrences with low hydrographic relief retained more U and approximated radioactive equilibrium more closely than those with high hydrographic relief. Effect of geologic structure was less than might be expected and this suggests that principal change is more recent than uplift to the Snowdrift peneplain. The experimental study indicates that carbonapatite is more effective than fluorapatite as a uranium accumulator and that it precipitates compounds which are unstable; as a consequence laboratory procedures produce a much richer product than is possible in nature. The outer shell of the pellets is depleted in U and is more friable than the fresh core. The reasonable regularity to distribution pattern of the U in the core of the pellets indicates that the U is original; the lesser U content of the small size pellets in any sample is due to depletion by leaching. Stripped cores of the pellets are in radioactive equilibrium, have not been leached and give the composition of the formation before leaching depletion; this content may be taken to be that of the rock below the zone of leaching. (auth)

3406 TEI-528-A
Geological Survey.
URANIUM IN THE CHATTANOOGA SHALE, YOUNGS BEND AREA, EASTERN HIGHLAND RIM, TENNESSEE. Thomas M. Kehn. June 1955. 61p.

Thirty drill cores from the Youngs Bend area show that in 21 square miles between Dry Creek and the Center Hill Reservoir the Gassaway member of the shale has an average thickness of 15 ft and an average U content of 0.0060%. In this area 620,000,000 tons of shale contain 38,000 tons of U. On the east side of Center Hill Reservoir two holes show the shale to be slightly greater in thickness and grade. Seven exploratory holes spaced at intervals of about 10 miles along the Eastern Highland Rim indicate that for a distance of about 50 miles south of Smithville the U content, thickness, and the structure of the shale is at least as favorable as in the Youngs Bend area. West of Dry Creek four of the holes show the shale to be below average in both thickness and U content. Likewise, the area north of Smithville on the Eastern Highland Rim, tested by three holes at about 12-mile intervals, is less promising because the U content of the shale decreases in that direction. Small synclines in the 32-square mile area tend to have a somewhat thicker section of the shale, particularly the upper unit of the Gassaway member. In these places the percentage of U of a given shale unit is as high as elsewhere, hence where the rich topmost unit is thick the average grade of the entire Gassaway member is thereby increased. Two ft of impure phosphatic shale of low U content were encountered in the top of the Chattanooga shale in two cores. It is not known to what extent this impure shale surrounds these holes, but it is believed

that these are local remnants of the phosphatic shale wedge that is present at the top of the Gassaway member to the north of Smithville. The Pine Creek site seems to offer as good a combination of grade, thickness, and geologic conditions as any now known in the shale. The shale is average in thickness and is slightly above average in U content. (auth)

3407

RESONANCE CAPTURE OF NEUTRONS IN PITCHBLENDES. Wolfgang Burkhardt. Naturwissenschaften 43, 534(1956). (In German)

3408

URANIUM ORES: THEIR OCCURRENCE AND TREATMENT. S. W. F. Patching (Mineral Dressing Group, Chemical Engineering Div., AERE, Harwell). Nuclear Power 2, 12-17(1957) Jan.

The modern metallurgical methods for extracting U economically are discussed for the production of high quality metal. The minerals associated with U ores and their locations are reviewed. (F.S.)

3409

URANIUM IN BLACK SHALE DEPOSITS, NORTHERN ROCKY MOUNTAINS AND GREAT PLAINS. W. J. Mapel. U. S. Geol. Survey Bull. 1030-H. 1956. 29p. and 2 illus.

Reconnaissance examinations for uranium in 22 formations containing black shale were made in parts of Montana, North Dakota, Utah, Idaho, and Oregon in 1953. About 150 samples from 80 outcrop localities and 5 oil and gas wells were submitted for U determinations. Most of the black shale deposits examined contain less than 0.003% of U; however, thin beds of black shale at the base of the Mississippian system contain 0.005% of U at 2 outcrop localities in southwestern Montana and as much as 0.007% of U in a well in northeastern Montana. An 8-ft bed of phosphatic black shale at the base of the Brazer limestone of middle and late Mississippian age in Rich County, Utah, contains as much as 0.009% of U. Commercial gamma-ray logs of oil and gas wells drilled in Montana and adjacent parts of the Dakotas indicate that locally the Heath shale of late Mississippian age contains as much as 0.01% of equivalent U, and black shales of Late Cretaceous age contain as much as 0.008% of equivalent U. (auth)

3410

PRELIMINARY GEOLOGIC MAP OF THE SOUTHEAST PART OF THE EDGEMONT NE QUADRANGLE FALL RIVER COUNTY, SOUTH DAKOTA. MINERAL INVESTIGATIONS FIELD STUDIES MAP MF 60. G. B. Gott and R. W. Schnabel. Washington, U. S. Geological Survey, 1956. $0.50.

3411

PROSPECTING FOR ATOMIC MINERALS. Alvin W. Knoerr, ed. New York, Toronto, and London, McGraw-Hill Book Company, Inc. 211p.

METALS AND METALLURGY

3412 AD-98299

Schwarzkopf Development Corp., Yonkers, N. Y.

EVALUATION OF NEW HIGH TEMPERATURE MATERIALS. Progress Report No. 3 [for] March 1, 1956–May 31, 1956. R. D. Grinthal. 42p. Contract AF33(616)-3198.

Addition of Cu to Mo disilicide does not produce beneficial effects on any of the physical properties tested. Oxidation resistance and impact strength are lowered. Hot pressing was not practical because of the presence of a liquid phase. Attempts to establish lower temperature equilibrium did not result in any improvement in properties. Several compositions in the Cr–Mo–Si system have been investigated. All had excellent oxidation resistance at 1000°C in air. Compositions based on mixtures of $CrSi_2$ and $MoSi_2$ were all low in strength and had no impact resistance. Compositions based on $MoSi_2$ with Cr additions did not in any case exceed the properties of $MoSi_2$. Four additional compositions have been arc-melted and identified by x-ray-diffraction methods, but no physical data on these are yet available. An investigation of part of the Ti–Mo–Si system has been started. Two compositions based on $TiSi_2$ + $MoSi_2$ and five based on $MoSi_2$ + Ti have been prepared. Chemical analyses and x-ray identification of the phases present are reported. No physical data are available. Nine compositions in the system Cr–Ti–Si have been arc-melted and identified by chemical and x-ray methods. No further data are available for this system. Several compositions in the Ti–Al–Ni system have been fabricated. The investigation of this system centers on the triangle formed by NiAl, NiTi, and TiAl. Phases present in this area are quite complex and difficult to identify with certainty. Further study will be necessary before more definite results can be published. (auth)

3413 AECD-4237

Los Alamos Scientific Lab., N. Mex.

THE PREPARATION AND CRYSTAL STRUCTURE OF SOME INTERMETALLIC POLONIUM COMPOUNDS. Willard G. Witteman, Angelo L. Giorgi, and Dwayne T. Vier. May 1953. Decl. with deletions Jan. 14, 1957. 23p. Contract W-7405-Eng-36. $4.80(ph OTS); $2.70(mf OTS).

A micro technique for the preparation of intermetallic polonium compounds is described. Advantages of the technique are: 1. Polonium compounds can be prepared on a microgram scale and in a closed system. 2. Reaction temperatures can be selected over a wide range. 3. The rate of reaction can be determined by gamma counting. 4. The reaction product is formed in a quartz capillary of suitable dimensions for direct x-ray-diffraction study. 5. The decomposition pressure of the compound can be determined as a function of temperature. 6. Stoichiometric ratios of the elements in the intermetallic compounds or solutions can be determined. Compounds of Po with Be, Ca, Mg, and Ni were prepared by this technique and their composition and crystal structure investigated by x-ray diffraction. The results obtained for the Be, Ca, and Mg compounds are:

Compound	Reaction Temp., °C	Crystal Form	Type	a_o (A)	c_o (A)	Density gm/cc
BePo	600	cubic	ZnS	5.838 ± 0.006	------	7.31
CaPo	550	cubic	NaCl	6.514 ± 0.006	------	6.01
MgPo	450	hexagonal	NiAs	4.345 ± 0.010	7.077 ± 0.020	6.72

Nickel and Po apparently form compounds with a composition and a crystal structure which vary continuously between NiPo and $NiPo_2$ and between NiAs and $Cd(OH)_2$ structures, respectively. Attempts to correlate experimentally determined mole ratios and calculated lattice constants were unsuccessful. A similar investigation of Po with Ta, W, and Mo evidenced no reaction at 500°C. (auth)

3414 AECU-3385

Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy.

ACTIVITIES IN LIQUID AND SOLID BINARY METAL SYSTEMS. Progress Report on Research Program [for] February 1, 1956 to January 31, 1957. John F. Elliott. Nov. 13, 1956. 14p. Contract AT(30-1)-1888. $3.30(ph OTS); $2.40(mf OTS).

The progress made in the selection of materials and in designing of equipment for making e.m.f. measurements of 600 to 1000°C on liquid and solid binary alloy systems under the subject contract is reported. General status of the program is reviewed briefly. (auth)

3415 AERE-Inf/Bib-108

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

BIBLIOGRAPHY ON PRESSURE DIE-CASTING EQUIPMENT. G. L. Cooper. Oct. 1956. 10p.

Reference to the literature which has appeared during the last ten years has been taken from Metallurgical Abstracts and Engineering Abstracts. The earlier literature is adequately covered by the books listed in Part 1 and the two bibliographies. The bibliography is divided into three parts. Part 1 gives some general references, while Parts 2 and 3 deal with die-casting machines and dies, respectively. The references are arranged alphabetically by author. Brief explanatory notes are included in parenthesis where it is thought necessary to supplement the title. (auth)

3416 HW-43428

Hanford Atomic Products Operation, Richland, Wash.

THE EFFECT OF COOLING RATE ON THE NUCLEATION AND GROWTH OF BETA-URANIUM HYDRIDE IN METALLIC URANIUM. H. R. Gardner and J. W. Riches. Oct. 12, 1956. 29p. Contract W-31-109-Eng-52. $0.25(OTS).

The Jominy end quenching technique was applied to uranium specimens to study the effect of cooling rate on the nucleation and growth characteristics of β-uranium hydride in metallic U. For cooling rates ranging from 0.002 to 300 C/second, it was determined that uranium hydride nucleated primarily at grain boundaries either as discrete particles or in conjunction with carbide type inclusions. The size of the hydride precipitate increased, and the number decreased, with decreasing cooling rate. Of metallographic importance was the development of a heat tinting technique for positive identification of the hydride precipitate. (auth)

3417 HW-43628

Hanford Atomic Products Operation, Richland, Wash.

CAPS CLAD WITH ALUMINUM-SILICON. D. C. Farland. June 13, 1956. 6p. Contract [W-31-109-Eng-52]. $1.80 (ph OTS); $1.80(mf OTS).

Caps fabricated from clad plate stock of Al-Si were tested to determine dimensional, chemical, wetting, and bonding qualities, reactivity and structure. No defects were found and a 2% increase in slug yield was realized and no significant process problems or defects were found. The slight added cost will be offset by the elimination of the centerless grinding now used. (F.S.)

3418 HW-44906

Hanford Atomic Products Operation, Richland, Wash.

FLOW STRESS RECOVERY OF ZIRCALOY-3b. Dale E. Johnson. Sept. 11, 1956. 21p. Contract [W-31-109-Eng-52]. $4.80(ph OTS); $2.70(mf OTS).

Increase in the strength of Zircaloy-3b, which results from cold working the material, is rapidly lost at moderately elevated temperatures. It was found that partial recrystallization of 40% and 60% cold-worked Zircaloy-3b occurred after 25 days and 12½ days at 400°C respectively. It is recommended that for design studies which involve the use of Zircaloy-3 in structural members the material strength be taken as that of the annealed alloy. (auth)

3419 NAA-SR-Memo-1269

North American Aviation, Inc., [Downey, Calif.]

PROPERTIES OF ZIRCONIUM AND ITS ALLOYS. PART I. PROPERTIES OF ZIRCONIUM. PART II. PROPERTIES OF ZIRCALOY 2. PART III. EXPERIMENTAL ALLOYS. P. J. Pankaskie. Mar. 11, 1955. Changed from OFFICIAL USE ONLY Dec. 21, 1956. 67p. $10.80 (ph OTS); $3.90(mf OTS).

3420 NLCO-608

National Lead Co. of Ohio, Cincinnati.

STANDARD OPERATING PROCEDURE FOR PREPARATIONS AND INSTRUCTIONS FOR HANDLING FIRES IN PLANT 9 PRODUCTION AND STORAGE AREAS. (Section 2.9.4). Robert W. Cahalane. Jan. 12, 1956. 6p. Contract AT(30-1)-1156. $1.80(ph OTS); $1.80(mf OTS).

Instruction and adequate preparations for handling and extinguishing fires in hazardous areas and means of minimizing damage and hazards to personnel and equipment are discussed. (J.E.D.)

3421 NLCO-618

National Lead Co. of Ohio, Cincinnati.

STANDARD OPERATING PROCEDURE FOR SAWING DEZINCED DERBIES — PLANT 9. (Section 2.5.3.26). Paul L. Kleinsmith. Apr. 28, 1955. 5p. Contract AT(30-1)-1156. $1.80(ph OTS); $1.80(mf OTS).

The precautions to be taken in sawing of dezinced derbies into sections suitable for primary electrode make-up for arc melting are presented. (auth)

3422 NP-6184

California. Univ., Berkeley. Minerals Research Lab.

VISCOUS CREEP OF ALUMINUM NEAR ITS MELTING TEMPERATURE. Technical Report No. 48. James G. Harper and John E. Dorn. Dec. 1, 1956. 27p. Contract N7-onr-295, Task Order II, NR-031-048.

The activation energy for high temperature creep of high purity Al is about 35,500 calories per mole over wide ranges of stress. At temperatures near its melting temperature, the secondary creep rate increases linearly with the stress over the low stress range extending up to about 13 psi. At intermediate stresses slightly above 13 psi the creep rate increases with the fourth power of the stress. (auth)

3423 NYO-6332

[Pittsburgh. Univ.].

APPLICATION OF CHEMICAL THERMODYNAMICS TO THE STUDY OF ALLOY FORMATION. Progress Report for April 1, 1956 to July 1, 1956. W. E. Wallace, R. S. Craig, W. V. Johnston, T. R. Waite, L. J. Hyvönen, K. F. Sterrett, and John S. Wollam. [July 2, 1956]. 6p. Contract [AT(30-1)-647]. $0.10(OTS).

Energies of activation for disordering of the nearly perfect $MgCd_3$ and Mg_3Cd superlattices are found by calorimetric means to be 16.5 ± 0.5 and 26 ± 1 kcal., respectively. Equipment was built for obtaining the heats, free energies, and entropies of formation of Ta-H solid solutions by the vapor pressure method. Heat capacities of W were measured from 4 to 15°K. C_p/T is linear with T^2 over the entire range. A Debye temperature of 378°K is found and the electronic specific heat coefficient is 1.11×10^{-3} joules/g. atom deg.^{2}. Good agreement is found between pycnometric and x-ray measurements of the densities of NaCl-NaBr solid solutions, indicating many fewer lattice defects in this system than were found in the NaCl-KCl system. (auth)

3424 NYO-6621

[Carnegie Inst. of Tech., Pittsburgh. Metals Research Lab.]

ELECTROCHEMICAL STUDIES OF NON-AQUEOUS MELTS. Progress Report [for] Period Ending February 1, 1956. R. F. Mehl and G. Derge. 7p. Contract AT(30-1)-1024.

Further investigations into the electrical conductivity of molten copper sulfide vs. sulfur activity, self-diffusion of Fe in Fe-C and Fe-S liquid systems, and electrolysis of FeO-MnO · SiO_2 slags are reported. (For preceding period see NYO-6620.) (T.R.H.)

3425 NYO-7652

Franklin Inst. Labs. for Research and Development, Philadelphia.

TECHNICAL PROGRESS REPORT. PART I. [PROGRESS ON WORK]. PART II. DIFFUSION OF THE ELEMENTS OF THE IB AND IIB SUB-GROUPS IN SILVER. A. Sawatzky and F. E. Jaumot, Jr. Dec. 1956. 19p. Contract AT(30-1)-1484. $3.30(ph OTS); $2.40(mf OTS).

Diffusion runs of Cu in Ag were made at eight temperatures in the temperature range from 700 to 950°C, for times ranging from 5 to 45 hours. Diffusion runs of Hg in Ag were made at 13 temperatures in the temperature range 650 to 950°C, for times ranging from 6 to 360 hours. (W.L.H.)

3426 SO-2049

General Electric Co. Research Lab., Schenectady, N. Y.

A SURVEY OF THEORETICAL MODELS FOR PRIMARY METALLIC SOLUTIONS. R. A. Oriani. Dec. 1956. 27p. Contract W-31-109-Eng-52. (56-RL-1658). $4.80(ph OTS); $2.70(mf OTS).

Although there exists no general theory of alloy formation at present, a few models of solutions have been developed which may be able to offer some guidance in choosing systems on which to work, in deciding which quantities it is most fruitful to measure, and in understanding his data. Of the statistical models, the successes and failures of the quasi-chemical theory are discussed; the conformal solution of Longuet-Higgins and the cell model of Prigogine are reviewed and their applicability to metallic solutions is considered. Models which endeavor to shed light on the fundamental aspects of solvent-solute interaction in metals are next discussed. These include the work of Varley and Friedel. Relevant experimental information from thermodynamics, x-ray diffraction, nuclear magnetic resonance, etc., is brought forward to display the strengths and weaknesses of these models. The atom-size effect is discussed particularly in relation to the alkali metal binaries, and the elasticity theory type of calculation is found to be unfruitful. The existing theoretical models are able to give the experimentalist some, but very little, qualitative guidance. (auth)

3427 SO-2050

General Electric Co. Research Lab., Schenectady, N. Y.

FUNDAMENTAL RESEARCH IN PHYSICAL METALLURGY. Thirty-second Quarterly Report. (Progress Report No. 49). R. E. Hoffman, R. A. Oriani, and D. Turnbull. Jan. 5, 1957. 5p. Contract W-31-109-Eng-52. (57-RL-1693). $1.80(ph OTS); $1.80(mf OTS).

The methods for determining whether or not there is any short-circuiting effect of dislocations on C diffusion in α-Fe have been developed. So far no such effect has been found, but the measurements have not been extended below 477°C. The enthalpies of formation of some liquid alloys of Ag–Si, Ag–Cu, and Au–Ni are reported. These results are, in general, consistent with the view that the interactions which determine the stability of liquid alloys are very similar to those which determine the stability of the corresponding solid alloys. (auth)

3428 TID-7523(Pt. 1)

Metallurgy Development Advisory Committee, AEC.

TECHNICAL PAPERS OF THE TENTH METALLOGRAPHIC GROUP MEETING HELD AT KNOLLS ATOMIC POWER LABORATORY, OCTOBER 24, 1955. H. P. Roth, comp. 100p. $0.70(OTS).

The papers presented are: A Macroetch for U; Castomold—A Self-curing Plastic for Mounting Specimens; New Etching Methods for Th; Inclusion Counting Methods for U; Microhardness Evaluation of Alpha Hot-Rolled U Rod for Drawing; Metallographic Determination of U–Nb Phase Diagram Up To 10% Nb; Metallography of Epsilon Phase in the U–Zr System; A Preliminary Report on the U–C System; Metallography for the Geneva Reactor Fuel Elements; Techniques for the Preparation of UO_2 Compacts for Microscopic Examination; Microstructure of Some Irradiated Nonfissionable Metals; Techniques for the Metallography of High Purity Al; Cooperative Program on Identification of Inclusions in U. (T.R.H.)

3429 WADC-TR-56-88

Dow Chemical Co., Midland, Mich.

INVESTIGATION OF ALLOYS OF MAGNESIUM AND THEIR PROPERTIES. Period Covered: March 1955 through December 1955. G. S. Foerster, S. L. Couling, H. Baker, and R. Johnson. Jan. 31, 1956. 92p. Project title: METALLIC MATERIALS. Task title: IMPROVED MAGNESIUM ALLOYS. Contract AF33(616)-2337. (AD-110541).

The development of improved Mg wrought alloys is reported. Two Mg–MM–Th–Zn–Zr wrought alloys—ZE11 (0.6Th–0.6Zr) in sheet and ZE31 (1Th–0.6Zr) in extrusions—have excellent properties at moderate temperatures, unobtainable in any conventional Mg alloy yet developed. Excellent properties at moderate temperatures can also be obtained by pellet extrusion of high temperature Mg alloys such as HZ32XA. High strength Mg–4Zn–1.5MM–1.5Mn sheet was developed for room temperature service but is slightly inferior to ZE41XA, a new experimental sheet alloy. Recent measurements of the thermal and electrical properties of several Mg alloys—AZ31A, HK31XA, HZ32XA, EK30A, EZ33A and HM21XA—are reported. Electrical resistivity varies from 5.3×10^{-6} for HM21XA–H24 to 9.1×10^{-6} ohms/cm^3 for cast AZ31A–F at room temperature and from 9.2×10^{-6} to 12.9 ohms/cm^3 for the same alloys at 500°F. The temperature coefficient of electrical resistivity is essentially constant at 0.90×10^{-8} ohms/cm^3/°F. The thermal conductivity of these alloys varies in the reverse order of their electrical resistivity and increases with increasing temperature. The plastic deformation and preferred orientation of wrought Mg alloys are discussed. Mechanical twinning is significant (15 to 20 vol. %) in the cold rolling of AZ31A and AX31B. The attempt to measure indirectly twin volume was only partly successful. Bend tests of Mg–2Al sheet indicate that twin volume decreases with increasing temperature but is still appreciable as high as 815°F. The role of heterogeneous deformation or banding in compressive working of Mg alloys is also discussed. (auth)

3430 AEC-tr-2668

CONTROL OF GAS CONTENT IN LIGHT-ALLOY [MELTS] Gustave Caminade. Translated by D. E. Cardamone from Fonderie, 2220-1(1950). 3p.

This control can be done in plants by different methods, but whatever the method used, these experiments are purely qualitative and only offer one possibility of comparison between the state of gassing of the different baths prepared. (auth)

3431

INVESTIGATION OF HOT-ROLLING CONDITIONS FOR TITANIUM ALLOYS. V. K. Belosevich, V. F. Kalugin, et al. Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk No. 10, 15-27(1956) Oct. (In Russian)

Results of investigations made of binary Ti–Al alloy in conditions of heat-compression treatment are reported. The studies were made of the microstructure of the alloy, the gas saturation, the rate of heating, the plasticity, the resistance to deformation in hot rolling, and the properties and changes in alloy properties at various temperatures of rolling. (R.V.J.)

3432
THE RELATION BETWEEN THE CHEMICAL COMPOSITION, TEMPERATURE AND HEAT RESISTANCE. III. QUINTUPLE SYSTEM OF Ni–Cr–W–Al–Ti ALLOY. I. I. Kornilov and F. M. Titov. Izvest. Akad Nauk S.S.S.R. Otdel. Tekh. Nauk No. 10, 117-22(1956) Oct. (In Russian)

Composition and polythermal diagrams plotted for Ni–Cr–W–Al–Ti alloys in a wide range of temperatures (up to 1250°) showed the complex relations between the heat resistance, chemical composition, and temperature. Transitions from one temperature to another caused quantitative and qualitative changes in the composition-heat-resistance diagrams. At lower temperatures (600 to 900°) the saturated solid solutions in the process of slow decomposition have a higher heat resistance than the homogeneous alloys. The maximum heat resistance (1000 to 1100°) was attained by alloy complexes in the transition from maximum saturation to supersaturation of the solid solution. (R.V.J.)

3433
RECRYSTALLIZATION OF TITANIUM AND ITS ALLOYS. III. EFFECTS OF ANNEALING TEMPERATURE ON THE MECHANICAL PROPERTIES AND MICROSTRUCTURE OF TITANIUM. E. M. Savitskiĭ and M. A. Tylkina. Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk No. 10, 125-7(1956) Oct. (In Russian)

3434
ALLOY STRUCTURE EFFECTS ON THE PROCESS OF DIFFUSION. L. M. Mirshiĭ. Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk No. 11, 40-51(1956) Nov. (In Russian)

A method and a procedure developed for determining the diffusion coefficient for each component in the complex nickel–tungsten binary alloy, the distribution of the components in the alloy, and the mechanism of the atomic transitions in crystalline lattice are reported. (R.V.J.)

3435
QUALITY CONTROL OF HIGH-TEMPERATURE ALLOYS. G. T. Harris (William Jessop & Sons Ltd., Sheffield, England). Metal Progr. 71, 90-4(1957) Jan.

The reduction in the variation in properties of high-temperature alloys indicates the alloys could be used at higher temperatures or higher stress levels than are now safe. Vacuum melting appears to be one method of reducing the variation. (auth)

3436
SURFACE PHENOMENA IN PYRO- AND ELECTRO-METALLURGICAL PROCESSES. A. I. Belyaev. Uspekhi Khim. 25, 1282-93(1956) Oct. (In Russian)

Studies in pyro- and electrometallurgy of black and nonferrous metals indicate to the importance of the surface reactions (angle of wettability, surface tensions, etc.) on the rate of metallurgical processes at elevated temperatures. Improved metallic recovery and reduction in the penetration of melted slags or salts into the furnace lining (electrolysis) can be attained by increasing the content of surface-inactive components (ions) at the border of the slag (salts) and metallic phases, or by reducing the content of surface-active components at the border of these phases. (R.V.J.)

3437
THE SIGNIFICANCE OF THE TENSILE TEST TO PRESSURE VESSEL DESIGN. W. E. Cooper (Knolls Atomic Power Lab., General Electric Co., Schenectady, N. Y.). Welding J. 36, 49s-54s(1957) Jan.

This paper presents a discussion of the yield pressure, maximum pressure, strain at maximum pressure and the localization of deformation at rupture in terms of the initial dimensions of thin-walled cylindrical and spherical shells and the material properties of vessels made of ductile materials. In addition, design with brittle materials is discussed briefly and the influence of strain concentrations upon differentiation between brittle and ductile materials is discussed. It is concluded that whereas initial yielding may be related to the properties usually reported from a tensile test, it is not possible to relate the maximum pressure which a cylindrical or spherical vessel can withstand directly to the ultimate tensile strength of the material from which it is constructed. (auth)

PHYSICS

3438 AECU-3148
California Research Corp., Richmond, Calif.
RADIATION RESISTANT GREASES. R. O. Bolt, J. G. Carroll, B. W. Hotten, and S. R. Calish. June 30, 1956. 47p. Contract AT(11-1)-174, Report No. 8.

Radiation resistance of a grease depends on the oil, the gelling agent, and the inhibitors and varies with each component of a formulation. Special additives introduced into a conventional grease are of decreasing value with radiation. Although initial performance can be increased, this effect appears to be lost with increased radiation. Greases of enhanced radiation stability can be made from alkyl aromatic oils and selected gelling agents. (auth)

3439 AERE-GP/R-1962
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
NON-RESONANT COUPLING OF RESONANT CAVITIES. P. D. Dunn, R. J. B. Hadden, and D. J. Thompson. Oct. 1956. 24p.

Various non-resonant methods of coupling together E_{010} resonators loaded with posts are discussed. Coupling was achieved by plain, radial, annular and dished holes and by wire loops. Bethe's theory is applied to the case of coupling of plain E_{010} cavities by circular holes and is compared with experiment. (auth)

3440 NP-6151
Bureau of Mines. Div. of Solid Fuels Technology, Pittsburgh.
FLOW PROPERTIES OF FINE PARTICLES. PART II. DISPERSION OF FINE POWDERS FROM SMALL RESERVOIRS. Final Report [for] March 1, 1952–October 30, 1955. Murray Weintraub and James W. Myers. 99p. Contracts CD4-480; CD3-679; and CD2-4014.

An investigation was conducted into the factors governing the dispersion of powders smaller than 10 μ in diameter from a packed state in a small reservoir into a transport tube. The system studied consisted of a reservoir in the shape of a cylinder 5 to 10 in. long and 0.75 to 1.50 in. in diameter. Outlet tubes varied from 4 to 14 in. in length and from $^1/_{16}$- to $^3/_{16}$-in. inside diameter. The "free-falling terminal velocity" of the particle agglomerate was disclosed to be a critical parameter of the reservoir design. For rates below this terminal velocity the quantity of powder that remains in the reservoir can be correlated with the gas velocity and reservoir dimensions by means of a simple fluidization theory. The influence of outlet tube dimensions upon gas quantity and pressure requirements and upon rate of solids flow was determined. The discharge of a powder designated as "Sm" was studied. The discharge could occur either as a fluidized flow or as a piston type of flow, depending upon the gas rate. From fluidization measurements it was estimated that the "Sm" consisted of agglomerates averaging 760 μ in diameter and a density of 0.49 g/ml. (auth)

3441 NYO-6623

Carnegie Inst. of Tech., Pittsburgh. Metals Research Lab.

ELECTROCHEMICAL STUDIES OF NON-AQUEOUS MELTS. Quarterly Progress Report for Period Ending June 1, 1956. R. F. Mehl and G. Derge. 8p. Contract AT(30-1)-1024.

The electrical conductivity of molten copper sulfide was measured at 1300°C. The dependence on S activity is the same as at lower temperatures. The self-diffusion coefficient of Fe in FeS_2 with 31.6% S is found to be: $D = 2.8 \times 10^5 e^{-63500/RT}$. The anomalous low current efficiency of $FeO-MnO-SiO_2$ slags has been confirmed. (auth)

3442 UCRL-3440

California. Univ., Berkeley. Radiation Lab.

SOME VITAL ROLES OF PLASTICS IN HIGH-ENERGY NUCLEAR RESEARCH. James O. Turner. Oct. 23, 1956. 43p. Contract W-7405-eng-48. $7.80(ph OTS); $3.30 (mf OTS).

A general discussion is given of the uses of plastics for electric isolation, radiation detection, and containment in high-energy nuclear research. The various instruments and auxiliaries utilizing plastics are illustrated. (B.J.H.)

3443

THE BATTLE OF THE MILLIDEGREE. William E. Keller (Los Alamos Scientific Lab., New Mexico). Nature 178, 883-7(1956) Oct. 27.

A survey of the two newest low temperature scales (one referred to as T55E presented by J. R. Clement of the US Naval Research Lab and another as T_{L55} by H. van Dijk and M. Durieux of the Kamerlingh-Onnes Lab. in Leyden) was made, and a single scale is suggested combining T_{55E} and T_{L55} and retaining the more favorable features of each. (F.S.)

3444

ON TRANSFORMATION OF THERMAL RADIATION INTO ELECTRICITY. V. B. Veĭnberg and Yu. V. Maltsev. Zhur. Tekh. Fiz. 26, 2373-7(1956) Oct. (In Russian)

A scheme of the heat transformation system and efficiency of solar boiler electrostation performances are discussed. (R.V.J.)

AEROSOLS

3445 HW-34315

[Hanford Atomic Products Operation, Richland, Wash.]

AIR SAMPLE ACTIVITY VS FLOW RATE. R. G. Clark. Dec. 27, 1954. Changed from OFFICIAL USE ONLY Jan. 11, 1957. 3p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

In an effort to determine the relation of air sample activity to sampling flow rate, it was found that air sample activity is not dependent on flow rate when sampling particles whose average diameter is 0.06 micron or greater. (F.S.)

COSMIC RADIATION

3446

K-MESON DECAY OF SLOW SECONDARY PARTICLES. A. A. Varfolomeev, R. I. Gerasimova, and L. A. Karpova. Doklady Akad. Nauk S.S.S.R. 110, 959-62(1956) Oct. 21. (In Russian)

The K-meson decay of slow secondary particles in the emulsion layer bombarded in the stratosphere was studied. A slow particle escaped from the 12 + On type star leaving the tracing of a 26μ long track a. At the point where track a stopped, two tracks of charged particles (b and c) formed, which scattered under a 165 + 10° angle to each other and at right angle to track a. The track b, 4.5 ± 0.5μ long, was dense, continuous, and did not have any fast δ electrons; the track c was of low density and stopped at 16.25 ± 0.25 mm from the apex of the secondary star. It did not initiate any other tracks of charged particles. However, the track c did not stop at the point of its disappearance but interacted in its flight producing neutral particles. The mass and the grain density of particle c have been measured, and the track c ascribed to a K meson. By assuming that the mass of the c particle is ~965m_e, its initial energy was resolved as 65 ± 5 Mev. None of the known unstable particles decay emitting K particles, thus it was resolved that the K^- meson is a secondary particle of some "heavy" hyperon with the mass $m_H \geq m_N + m_K + 60$ Mev or "heavy" meson with mass $m_X \geq m_K + 60$ Mev, where m_N and m_K are the mass of nucleon and K meson, respectively. Consequently, in principle, the star b-c could form as the result of nuclear spallation induced by a heavy hyperon (mesons), as a result of its decay or as the decay of unstable fragment. However, the "heavy" hyperon (meson) decays relatively slow (~10^{-12} sec) which leads to the assumption that there exists some reaction causing the slowing down of the decay process. Interpretations of the reaction scheme and the summary are presented. (R.V.J.)

3447

RADIOACTIVE SULPHUR PRODUCED BY COSMIC RAYS IN RAIN WATER. P. S. Goel (Tata Inst. of Fundamental Research, Bombay). Nature 178, 1458-9(1956) Dec. 29.

3448

NEW DETERMINATIONS OF THE INTENSITIES OF PRIMARY COSMIC RAY ALPHA PARTICLES AND Li, Be, B NUCLEI AT $\lambda = 41.5°$ USING A ČERENKOV DETECTOR. W. R. Webber (State Univ. of Iowa, Iowa City). Nuovo cimento (10) 4, 1285-1306(1956) Dec.

Measurements of the intensities of the α particles and Li, Be, B nuclei in the primary cosmic radiation have been made at an average atmospheric depth of 18.5 g/cm^2 in two "Skyhook" balloon flights at $\lambda = 41.5°$. The measuring instrument consisted of a thin (3.0 g/cm^2) Cherenkov detector placed within the solid angle of a Geiger counter telescope. This detector yielded unusually good resolution of the α particle and Li, Be, B components. This fact and the slow rate of rise of the two balloons made possible a detailed determination of the dependence of α particle intensity on atmospheric depth. The quality of the data justified a new approach to the problem of extrapolating the α particle intensity to the top of the atmosphere. This extrapolation was carried out by applying a "diffusion" equation of the type previously used for nuclei with $Z > 2$ to the observed pressure-altitude dependence of α particle intensity. The resulting estimate of the α particle intensity at the top of the atmosphere is significantly lower than previous estimates. At 18.5 g/cm^2 the sum of the vertical intensities of the Li, Be, B components was found to be (3.11 ± 0.31) (m^2.sr.s)$^{-1}$ and the intensities $J_{Li}/J_{Be}/J_B$ were found to be as 3/4/2. The (light nuclei/medium nuclei) intensity ratio at the top of the atmosphere as determined by this experiment was 0.35 ± 0.09. The vertical intensities at the top of the atmosphere of the various components of the primary radiation as obtained in this experiment at $\lambda = 41.5°$ are tabulated. (auth)

3449

ANISOTROPY OF COSMIC RAYS DURING THE COSMIC-RAY STORMS. S. Yoshida (Nagoya Univ.). Nuovo cimento (10) 4, 1412-32(1956) Dec.

Various phenomena about the cosmic-ray diurnal variations, especially anomalous diurnal variations associated with geomagnetic storms, were studied. A very important

part of cosmic-ray diurnal variations was interpreted as the result of the anisotropic flow of cosmic rays which takes place during the cosmic ray storms. Through a study of the energy and latitude dependence of the anomalous diurnal variations, it was indicated that this anisotropy is produced by the acceleration of cosmic rays in the solar stream. The variations of this acceleration observed at various positions in a solar stream, the variations in different streams of various ages, and the variation in a 11-year period are described. (auth)

3450

A HIGH ENERGY JET IN NUCLEAR EMULSIONS. F. D. Hanni, C. Lang, M. Teucher, H. Winzeler, and E. Lohrmann. Nuovo cimento (10) 4, 1473-8(1956) Dec.

In stripped emulsions Ilford G5 a nuclear interaction of the type 20 + 56p was found. In the very dense core of this jet, 6 secondary interactions were found, 4 of which are produced by singly charged primaries, the other 2 by neutral particles. The average energy of these secondary interactions is about 200 Bev. From this and from the angular distribution of the primary jet an energy of 10^{13} ev is deduced. The interaction mean free path of the charged particles in the core is 54^{+38}_{-21} cm. (auth)

3451

ATMOSPHERIC EFFECTS ON THE COSMIC RAY TOTAL INTENSITY AT SEA LEVEL. R. Bachelet and A. M. Conforto. Nuovo cimento (10) 4, 1479-95(1956) Dec.

The atmospheric effects on the total intensity of cosmic rays at sea level have been studied from an experimental point of view according to three different methods proposed by Duperier, Olbert, and Dorman. One year's cosmic-ray measurements have been analyzed with respect to the day-to-day and seasonal variation. The results are discussed in comparison with the findings of other authors. (auth)

3452

ABSORPTION MEASUREMENT OF COSMIC RAYS WITH A SCINTILLATION COUNTER. C. Burckhardt. Helv. Phys. Acta 29, 533-44(1956). (In German)

ELECTRICAL DISCHARGE

3453 UCRL-4530

California. Univ., Livermore. Radiation Lab.

THE ANATOMY OF PLASMONS. Winston H. Bostick. Nov. 15, 1955. 29p. Contract W-7405-eng-48. $4.80 (ph OTS); $2.70(mf OTS).

Plasmons (plasma-magnetic entities) are toroidal "packages" of plasma wrapped up in their own magnetic field. Experimental evidence for the existence of plasmons is adduced and theoretical considerations concerning their various types and their stability are discussed. (auth)

ELECTRONS

3454

EXPERIMENTAL INVESTIGATIONS OF THE ANGULAR DISTRIBUTION AND POLARIZATION OF OPTICAL EMISSIONS OF ELECTRONS IN A SYNCHROTRON. F. A. Korolev, V. S. Markov, E. M. Akimov, and O. F. Kulikov. (Lomonsov Moscow State Univ.). Doklady Akad. Nauk S.S.S.R. 110, 542-4(1956) Oct. 1. (In Russian)

Experiments were made in an electron synchrotron to determine the angular distribution of the intensity and polarization of electron emissions. A special optical installation with polarization devices was used to study electron emissions for the polarization component with an electric vector parallel to the orbit plane (the σ-component), and for the component with an electric vector perpendicular to the electric vector of the first component (the π-component). The microphotographs of electron emissions and the curves of the angular distribution of electron emission intensities for π- and σ-component polarization show that the experimental data agreed with the theoretical data based on the theory of the "photoluminescent" electron. (R.V.J.)

3455

REFLECTION OF SLOW ELECTRONS FROM PURE METAL AND FILM COATED METAL SURFACES. D. A. Gorodetskiĭ (Shevchenko Kiev State Univ.). Izvest Akad. Nauk S.S.S.R. Ser. Fiz. 20, 1023-4(1956) Sept. (In Russian)

Reflection coefficients of slow electrons (2 to 10 ev) from a W surface heat treated in vacuum, from layers of Ba and Ag blown on the W in vacuum, and from the W coated by thin layers of O and Ba were studied. It was found that reflection coefficients of electrons with less than 4 ev are very sensitive to the condition of the metal surface. Measurements were taken from the W target at 1700°K and immediately after the Ba and Ag were blown on it. (R.V.J.)

3456

EFFECTS OF ELECTRON BOMBARDMENT ON THE PHOTOELECTRONIC EMISSIONS FROM COMPLEX PHOTOCATHODES. L. I. Bykhovskaya. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 1052-63(1956) Sept. (In Russian)

Results are reported of investigations carried out by an electronic-optical method, and by measuring the photocurrent before and after electron bombardment. Conditions intensifying the sensitivity in semi-transparent and thick oxygen–cesium cathodes with up to 20 μA/lm have been determined. Cathode emissions increased in the spectra range of $\lambda > 600$ mμ, reaching the maximum increase with $\lambda > 900$ mμ. The dependence of the photocurrent increase, after the electronic bombardment was expressed in all cathodes by sharp maximum in the range of 950 to 1150 mμ, and for the semi-transparent cathodes, also, by a small maximum at $\lambda = 700$ mμ. The saturation point for semi-transparent ones was reached at $Q = 0.84 \times 10^{-4}$A sec mc^{-2}, and for the thick ones at $Q = 1.68 \times 10^{-8}$A sec cm^{-2}. Electronic bombardment of semi-transparent cathodes with a high integral sensitivity above 20 μA/lm did not induce any photocurrent acceleration. (R.V.J.)

3457

INVESTIGATION OF THE STATES OF AN ELECTRON IN A PROPOSED ELECTROMAGNETIC FIELD. E. van der Spuy (Univ. of Stellenbosch, South Africa). Nuovo cimento (10) 4, 1349-63(1956) Dec.

This investigation discusses, in terms of quantum mechanics, the polarization of a beam of electrons in a proposed experiment which is a modification of the Rabi type of radio-frequency spectroscopy experiment. The level structure of the electron in the uniform field and its discrimination in the inhomogeneous fields, as well as the stimulated transitions in the uniform field, is discussed essentially in quantal terms. (auth)

3458

FORMATION OF HIGH-DENSITY ELECTRON BEAMS. George R. Brewer (Hughes Aircraft Co., Culver City, Calif.). J. Appl. Phys. 28, 7-15(1957) Jan.

The physical principles underlying the design and performance of electron guns suitable for the generation of high-density electron beams (beam current density of the order of 200 amp/cm^2) are discussed. Initiation of the flow of a cylindrical electron beam focused by a uniform magnetic field is described, with emphasis on the design of the electron gun. The principles underlying the Pierce design procedure for space-charge limited electron guns is treated, including the limitations and the modifications necessary when used for very high-density beams. Means are suggested for partial compensation of the electric field

distortion due to the anode aperture of the gun. The effects on the beam and resulting limitations in gun design due to thermal velocities of emission are described. The experimental techniques for study of gun and beam performance are described, together with some results of these studies. These techniques include detailed measurement of beam characteristics, such as current density and transverse velocity distributions, both with and without a magnetic field. These measurements illustrate a number of deviations of actual electron flow from that usually considered in the simple theories. (auth)

GASES

3459 AECU-3376

RAND Corp., Santa Monica, Calif.

THE SPECIFIC HEAT OF A DEGENERATE ELECTRON GAS AT HIGH DENSITY. Murray Gell-Mann. Nov. 11, 1956. 13p. For Univ. of Calif. Radiation Lab. Contract [W-7405-eng-48]. Subcontract SC-101. (RM-1823(AEC); AD-112391). $3.30(ph OTS); $2.40(mf OTS).

The methods of the paper (RAND Research Memorandum RM-1802-AEC, "The Correlation Energy of an Electron Gas at High Density," by K. A. Brueckner and M. Gell-Mann) are generalized so that not only the ground state but also the low excited states of an electron gas can be discussed. The energy levels relative to the ground state are the same as those of a gas of independent particles where the energy of each particle (in Rydbergs) is a certain function W(p) of its momentum (expressed in units of the Fermi momentum). The specific heat of the gas at low temperature is proportional to the density of single particle levels at the surface of the Fermi sea, or inversely proportional to $(dW/dp)_{p=1}$. This last quantity is calculated for high density (small r_s, where density is proportional to r_s^{-3}) and compared to the corresponding quantity for a free electron gas. The ratio is found to be $1 + .083\, r_s\, [-\ln r_s - .203]$ + higher terms in r_s. The expansion is exact and may be compared with the approximate result of Pines, who finds $1 + .083\, r_s\, [-\ln r_s + 1.47] + \ldots$. (auth)

3460 ORNL-1322

Oak Ridge National Lab., Tenn.

EXPLOSION AND DETONATION PROPERTIES OF MIXTURES OF HYDROGEN, OXYGEN, AND WATER VAPOR. T. H. Pigford. Aug. 28, 1952. Decl. Dec. 13, 1956. 94p. Contract W-7405-eng-26. $15.30(ph OTS); $5.40(mf OTS).

The hazards due to chemical explosion and detonation of dissociation gases in homogeneous reactor systems is considered. (auth)

3461 Y-706

Oak Ridge National Lab., Y-12 Area, Tenn.

RECOMBINATION OF STOICHIOMETRIC MIXTURES OF HYDROGEN AND OXYGEN IN A FLAME RECOMBINER; FEASIBILITY REPORT. H. M. McLeod, Jr., Don Phillips, T. S. Mackey, and W. R. Grimes. Jan. 1, 1951. Decl. Dec. 13, 1956. 36p. Contract W-7405-eng-26. $6.30(ph OTS); $3.00(mf OTS).

Combination of hydrogen and oxygen in stoichiometric proportions in an enclosed burner recombiner has been investigated. Operation of this unit has demonstrated the essential feasibility of such equipment when applied to the HRE. Preliminary small-scale tests were conducted to permit selection of a suitable burner orifice; on the basis of these tests the pilot plant was designed to accomplish the reaction in a closed system. Use of a small catalytic recombiner as a unit to handle gases which pass the burner has been shown to be satisfactory. (T.R.H.)

3462 Y-731

Oak Ridge National Lab., Y-12 Area, Tenn.

EXPLOSION LIMITS IN MIXTURES OF HYDROGEN, OXYGEN, STEAM, AND HELIUM. D. W. Kuhn, F. L. Daley, A. D. Ryon, A. A. Palko, and W. R. Grimes. Mar. 1951. Decl. Dec. 13, 1956. 16p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

Explosion limits of gas mixtures containing hydrogen, oxygen, steam, and He have been investigated for various percentages of electrolytic gas over a wide range of temperature and pressure. Experiments were carried out to show the magnitude of the pressures developed during explosions of hydrogen-oxygen mixtures. Data are presented in tabular form. (T.R.H.)

INSTRUMENTS

3463 A-3751

[Kellex Corp., New York].

SPECIAL 616 LINE RECORDER. W. T. Leland and E. Glarborg. Oct. 5, 1945. Decl. Dec. 4, 1956. 14p. $3.30(ph OTS); $2.40(mf OTS).

The special line recorder is a modified standard line recorder differing fundamentally from the standard line recorder, in that it does not employ a Pirani gage flow meter. This is made possible by running the entire sample gas directly into the ion source. The ion source has been specially constructed to give a reasonably long source life. Further considerations have been given to making the sample lead as short as possible to obtain more favorable conditions for measuring small amounts of corrosive gases and those gases which show tendencies of sticking to surfaces. (auth)

3464 AECU-3182

Du Mont (Allen B.) Labs., Inc. Tube Research Labs., Passaic, N. J.

DEVELOPMENT OF PHOTOMULTIPLIER TUBES. Report No. 17 [for] March 1, 1955 to May 31, 1955. Bernard R. Linden, Philip A. Snell, and Robert E. Rutherford. 15p. Included is an appendix: THE MANUFACTURE OF MULTIFORM STEMS. Gilbert Sidweber. Contract AT(30-1)-1336. $0.20(OTS).

Several tubes were constructed using Cs–Sb dynode surfaces. Work was continued on large cathode area multiplier tubes. The manufacture of plug-in multiform stems is discussed. Work on transit time spread improvement is summarized. (B.J.H.)

3465 CF-57-1-13

Oak Ridge National Lab., Tenn.

HIGH PRESSURE FLANGE STUDIES. K. J. Fritz. Jan. 5, 1957. 19p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Twenty-five hundred psi ring-type flanges, ring gaskets, bolts, and special connectors were tested for adaptability to the aqueous homogeneous reactor. High pressure line closures were studied to obtain empirical data pertinent to the selection or design of a connector capable of withstanding sustained thermal cycling and high pressures encountered in the aqueous homogeneous reactor. Specialized stress-strain measurement techniques yielded information concerning flange deformation, ring type gaskets, bolts, and special connectors. The results indicated that no totally acceptable connector is currently available. Most promising of the combination of components tested during this period was a 2500 psi ring type flange with an accurately machined octagonal gasket and Grade B-7 bolts. (auth)

3466 CF-57-1-49

Oak Ridge National Lab., Tenn.

THE PRESSURE BRIDGE DENSITY METER FOR CONTINUOUSLY METERING DENSITIES OF FLOWING STREAMS. R. P. Wichner and C. F. VandenBulck. Jan.

10, 1957. 13p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A new type of continuous density meter, applicable for use with ThO_2 slurry in high temperature–pressure systems, was tested successfully in a low-temperature slurry loop. The slurry concentration was varied from 100 to 1100 g Th/Kg H_2O for which the average deviation between predicted density and that determined by sampling into a tared graduate cylinder was 0.019 g/ml, equivalent to an average percent deviation of 1.20%. A bias in the test data was found when the sample density was calculated from the chemical Th content using 9.69 g/ml as the density of the ThO_2 particle. The slurry velocity in the bridge was varied from 1 to 7½ ft/sec (equivalent to throughputs of 5 to 40 gpm) without causing any noticeable error in the readings. (auth)

3467 KAPL-M-HOP-1

Knolls Atomic Power Lab., Schenectady, N. Y.

AN ANALYSIS OF THE MODE OF RESPONSE OF A LIQUID FILLED DIFFERENTIAL PRESSURE TRANSDUCER SYSTEM. H. Paitchel. Jan. 8, 1957. 26p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

An analysis has been made on the mode of action of the response of a fast differential pressure transducer to a changing pressure signal. The analytical results indicate that fast transducers are available for monitoring fast flow transients in reactor systems despite the fact that long lengths of small diameter tubing must be used between primary flow sensor and transducer. In addition, the analysis serves to explain the influence of tubing length and diameter, and spring constant in the over-all response of a liquid filled transducer system. (auth)

3468 LA-2084

Los Alamos Scientific Lab., N. Mex.

A PRECISION CALORIMETER FOR THE MEASUREMENT OF HEATS OF COMBUSTION. Charles E. Holley, Jr. and Elmer J. Huber, Jr. Nov. 1955. 18p. Contract W-7405-eng-36. $0.20(OTS).

A description is given of the construction, operation, and calibration of a precision combustion calorimeter designed for the measurement of the heats of combustion of metals and combustible metallic compounds. (auth)

3469 NARF-56-26T

Convair, Fort Worth, Tex.

NTA FREQUENCY AND VOLTAGE MONITORING SYSTEMS. C. M. Travis and B. M. Lasater. Dec. 5, 1956. 53p. Project 6(1-9964). Contract AF33(600)-32054. (MR-N-121).

In developing instrumentation for the Nuclear Test Aircraft (NTA), it was found that certain instrumentation was sensitive to variations in the frequency and amplitude of the 117-volt 400-cps power source and in the amplitude of the 117-volt 60-cps power sources. It was also found that the fast-neutron dosimeters (FND) and anthracene scintillation dosimeters (ASD) were quite sensitive to variations in the high voltages used with their detectors. To allow compensating corrections to be made to the data obtained, two monitoring systems were developed. One, a frequency and voltage monitoring system, monitors the voltage and frequency of one phase of the 400-cps power source and the voltage of the three 60-cps power sources. This unit is mounted on a chassis 17 inches wide, 10 inches deep, and 4 inches high, with a 19-inch by 7-inch face panel. It fits a standard rack mount, weighs 18½ pounds, and consumes approximately 135 watts of 400-cps power and 10 watts of 60-cps power. The unit consists of a frequency monitor and amplifier, four identical voltage monitors, and a regulated power supply. Outputs are recorded on continuous strip-chart recorders. The other is a high-voltage monitoring system which is used to monitor the positive high voltages for the FND detectors and the negative high voltages for the ASD detectors. It consists of a calibration unit, a switching system, an amplifier unit, and two magnetic tape recorder channels. The over-all system consumes approximately 25 watts of 400-cps power and less than one watt of 28-vdc power. The calibration unit and the amplifier unit, which are mounted on a chassis 17 inches wide, 13 inches deep, and 2 inches high, fit standard rack mounts; they weigh 10 pounds and 15½ pounds, respectively. This system accepts the monitoring voltages from the high-voltage batteries and applies them to the recorder channels in sequence. The voltage and frequency monitor has proved very satisfactory, having operated for six months with only one malfunction. This malfunction, caused by the failure of a rectifier tube which arced over, was corrected by replacing the tube. No further trouble has been experienced. The high-voltage monitor has proved less satisfactory because of excessive drain on the batteries being monitored. However, this monitoring system should prove satisfactory when the batteries are replaced by electronic power sources capable of supplying adequate current to operate both the detectors and the monitor. (auth)

3470 NYO-8006

Princeton Univ., N. J.

TEMPORARY AND PERMANENT EFFECTS PRODUCED BY RADIATION ON SOLIDS. ELECTRON SPIN RESONANCE APPARATUS FOR DETECTING RADIATION DAMAGE. Ricardo C. Pastor, John Weil, and John Turkevich. Aug. 15, 1956. 26p., 6 illus. Contract AT(30-1)-1158. $10.80(ph OTS); $3.90(mf OTS).

A description is given of the construction and performance of an electron spin resonance apparatus operating at 9,200 mc/sec and one operating at 51 mc/sec. Circuit diagrams are presented and the performance indicated in terms of electron spin resonance absorptions of alpha, alpha diphenyl picryl hydrazyl (DPPH), ZnS phosphor containing manganese, and neutron damaged quartz. (auth)

3471

MILLIMICROSECOND TIME ANALYZER. C. Cottini and E. Gatti (CISE, Milano). Nuovo cimento (10) 4, 1550-7 (1956) Dec.

A millimicrosecond time analyzer is described. For artificial pulses of 0.1 V minimum amplitude and some mμs width, the resolving power is about 5×10^{-11} s. The instrument works on frequency conversion of two high frequency sinusoidal damped waves ballistically excited by the input pulses. (auth)

3472

TRENDS IN RADIOACTIVITY-MEASURING INSTRUMENTS. Denis Taylor (Electronics Div., Harwell). Nuclear Power 2, 17-21(1957) Jan.

Counting systems for radioactive assay consist of a particle or radiation detector, pulse amplifier, pulse amplifier discriminator and a scaler or counting rate meter. New design trends are discussed with improved facilities and performance and fault free service. (F.S.)

Refer also to abstract 3504.

ISOTOPES

3473

THE ISOTOPIC EXCHANGE OF OXYGEN IN MINERAL OXIDES WITH CO_2 AND ITS USE FOR DETERMINING THE ACTIVE SURFACE VALUE. E. I. Dontsova (Vernadskiĭ Inst. of Geochemistry and Analit. Chemistry). Doklady Akad. Nauk S.S.S.R. 110, 589-92(1956) Oct. 1. (In Russian)

3474

RECENT USES OF RADIOACTIVE ISOTOPES IN BRITAIN. John F. Cameron (U. K. Atomic Energy Research Establishment, Harwell, England). Metal Progr. 71, 103-8 (1957) Jan.

MATHEMATICS

3475 ASAE-2

American Radiator and Standard Sanitary Corp. Atomic Energy Div., Redwood City, Calif.

A GENERAL PURPOSE MONTE CARLO PROGRAM FOR THE IBM 704. PART I. METHOD. Edward J. Leshan. Sept. 1956. 28p. $4.80(ph OTS); $2.70(mf OTS).

A general purpose neutronics Monte Carlo code designed to solve a wide variety of problems about the behavior of neutrons in system which are complex because of the irregularity of the geometry, time dependence, anisotropic scattering, or multiplicity of regions and materials is described. A wide varity of surfaces, such as cylinders, spheres, planes, and conical cylinders can be handled by this method. The code appears to be comparable in speed with two-dimensional transport calculations. (F.S.)

MEASURING INSTRUMENTS AND TECHNIQUES

3476 DP-176

Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.

A DIRECTIONAL ION CHAMBER INSTRUMENT FOR MEASURING HIGH-LEVEL GAMMA ACTIVITIES. James S. Stutheit. Sept. 1956. 11p. Contract AT(07-2)-1. $0.15 (OTS).

An ion chamber was built to survey intense γ sources located in a shielded enclosure. The instrument is moved about in the enclosure by means of a crane, and is highly directional. It measures γ fields from 1 to 10,000 r/hr. (auth)

3477 DP-177

Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.

A BETA-GAMMA MONITOR FOR LIQUID STREAMS. Edward C. Wingfield. Sept. 1956. 12p. Contract AT(07-2)-1. $0.15(OTS).

A continuous β-γ monitor was developed for liquid streams that may contain traces of radioactivity. A hollow, rotating cylinder of liquid surrounds, but does not touch, a plastic scintillator. The scintillations are viewed by a photomultiplier tube and are indicated by a count rate meter. The instrument detects source concentrations as low as 10^{-11} curie/ml. (auth)

3478 NRL-4746

Naval Research Lab., Washington, D. C.

TECHNIQUES FOR USING FISSIONABLE DEPOSITS IN NEUTRON MEASUREMENTS. A. Brodsky, L. W. Fagg, and T. D. Hanscome. Apr. 19, 1956. 14p.

Techniques have been developed for the measurement of time integrated fluxes of neutrons using fissionable deposits faced against nuclear plates. These techniques are applicable to the measurement of fast neutron doses greater than 10^{10} neutrons/cm^2. The methods of calculating fission fragment absorption, and of electrodeposition of the fissionable elements used are also generally applicable for work with fission counters and for other purposes. In addition, the procedure for electrodeposition appears favorable as a method for radiometric assay of type 5f rare earth elements. (auth)

3479 NYO-4698

Columbia Univ., New York. Radiological Research Lab.

ANNUAL REPORT ON RESEARCH PROJECT. Apr. 1, 1956. 161p. Contract AT-30-1-GEN-70. $1.00(OTS)

Radiological Physics. Progress is reported in studies on the following: the calibration of ionization chambers for radiobiological experiments involving both fast and slow neutrons; calibration of a Sr^{90} surface applicator; relative and absolute determinations of the average energy loss per ion pair produced by electrons; measurements on relative specific energy absorption in various media; the complete saturation of ionization chambers; the measurement of tissue dose produced by P^{32} and S^{35} localized in small lesions; the characteristics of radiophotoluminescent dosimeters; and studies on mechanisms of radioinduced mutations in bacteria Radiobiology. Research published and manuscripts submitted for publication since the last report are listed. Progress is reported in studies on the following: determination of the radiosterilization dose for adult and fetal mice; the protective effects of β-mercaptoethylamine and becaptan disulfide against x irradiation sterilization of female mice; relationship of gonadal hormones to radiation protection; effects of in utero irradiation on psychological behavior of rats; effects of irradiation on protein metabolism in the lenses of both young and adult rats; and the post-irradiation protection afforded rabbits by the intra-peritoneal injection of splenic plasma. (For preceding period see NYO-4642.) (C.H.)

3480 NYO-4751

New York Operations Office. Health and Safety Lab., AEC.

SUMMARY OF ANALYTICAL RESULTS FROM THE HASL STRONTIUM PROGRAM TO JUNE 1956. John H. Harley, Edward P. Hardy, Jr., George A. Welford, Ira B. Whitney, and Merril Eisenbud. Aug. 31, 1956. 39p. $0.30(OTS).

A network of stations were established in 1951 throughout the United States and extended to many parts of the world in 1952 for the purpose of sampling fall-out from nuclear explosions. Gummed films representing a 24-hour collection of fall-out are ashed and counted for β activity which is then extrapolated to Sr^{90} content. Samples of soil, vegetation, animal bone, drinking water, milk, and urine collected at various places were also assayed for Sr^{90} content. Analytical results are summarized. (C.H.)

3481 USNRDL-TR-115

Naval Radiological Defense Lab., San Francisco.

A WIDE RANGE, GAMMA SENSITIVE, LIQUID FLOW MONITOR. K. F. Sinclair. Oct. 30, 1956. 23p. Project NS 088-001.

The system described in this paper was designed for continuous observation and recording of gamma activity levels from mixed fission-product contamination in liquid media. This equipment has been used for large-scale decontamination studies in conjunction with other types of gamma instrumentation. In order to correlate the measurements, an approximately roentgen flat response was required from the scintillation detector used. To obtain this, a stepped lead filter was employed. The counter is a new type of logarithmic rate meter and the analog information is recorded on a potentiometer recorder. The system will cover seven decades and at maximum sensitivity the device will detect 5×10^{-4} microcuries per liter at 1.2 Mev. (auth)

3482

HIGHER-ORDER FOCUSING IN THE $\pi\sqrt{2}$ β-SPECTROMETER. G. E. Lee-Whiting and E. A. Taylor (Atomic Energy of Canada Limited, Chalk River, Ontario). Can. J. Phys. 35, 1-15(1957) Jan.

The expansion coefficients of that magnetic field which gives best focusing in the high-aperture double-focusing

spectrometer have been determined to the sixth order. The analytical calculations have been checked by numerical integration of the equations of the orbits. The third- and fourth-order coefficients published previously are not in agreement with these results. (auth)

3483

GAMMA SPECTROMETER WITH ANTICOINCIDENCE ADJUSTING. D. Maeder and R. Müller. Helv. Phys. Acta 29, 44ℓ-9(1956). (In German)

3484

PRECISION MAGNETIC α SPECTROMETER. L. L. Gol'din and E. F. Tret'yakov. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 859-67(1956) Aug. (In Russian)

The scheme and descriptions are given of an α spectrometer which has been in operation since 1952. The resolving power of the apparatus (the peak width at half-height) was given at 7.5 kv with α particle energies at 5.3 Mev. On the spectrometer were found α lines corresponding to a partial half-decay period of 5×10^8 years and the lines lying within the distance of 12 kev have been resolved. The negative and positive picture of Pu^{240} α spectra in the range of 5 Mev is presented. (R.V.J.)

3485

TWO-METER CRYSTAL CRYSTAL-DIFFRACTION γ SPECTROMETER. P. I. Lukirskiĭ and O. I. Sumbaev (Mendeleev All Union Research Inst. of Metrology). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 903-8(1956) Aug. (In Russian)

Descriptions are given of the design and performance of a two-meter crystal diffraction γ spectrometer of the Du-Mond type. (R.V.J.)

3486

NEW METHOD FOR IMPROVING THE FOCUSING PROPERTIES OF A LENS SPECTROMETER. B. S. Dzhelepov, No Sen Chan, and P. A. Tishkin (Zhdanov Leningrad State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 947-50 (1956) Aug.

Descriptions are given of the design and performance of a lens spectrometer with improved focusing achieved by placing additional coils which produce corrective transverse fields. The best results have been obtained from a system of 16 triangular, single-layer coils placed in 15 cm from the source. Curves of measurements taken on the improved lens spectrometer are given and their analysis presented. (R.V.J.)

3487

THYROID UPTAKE MEASUREMENTS. G. J. Hine, B. A. Burrows, and J. F. Ross (Radioisotope Service, Veterans Administration Hosp., and Boston Univ., School of Medicine, Boston, Mass.). Nucleonics 15, No. 1, 54-7(1957) Jan.

The use of plastic scintillators and a discussion of the principles involved in thyroid uptake measurements are described. (W.L.H.)

3488

TECHNIQUE FOR MONITORING TRITIATED-WATER VAPOR IN AIR. C. A. Ziegler and A. Schwebel (National Bureau of Standards, Washington, D. C.). Nucleonics 15, No. 1, 64(1957) Jan.

A method is presented for calibration of an ionization chamber for monitoring tritiated-water vapor in air. (W.L.H.)

3489

IONIZATION-CHAMBER METHOD OF MEASURING MIXED γ-n FIELDS OF KNOWN ENERGY. Keran O'Brien and J. E. McLaughlin, Jr. (Health and Safety Lab., New York Operations Office, AEC, N. Y.). Nucleonics 15, No. 1, 64-7 (1957) Jan.

A method is presented for determining the x-ray dose and neutron flux in a mixed field of radiation using two or more ionization chambers of differing atomic compositions. (W.L.H.)

3490

QUANTITATIVE MEASUREMENT OF S^{35} IN BIOLOGICAL SAMPLES. R. K. Poddar (Biophysics Div., Inst. of Nuclear Physics, Calcutta, India). Nucleonics 15, No. 1, 82-3(1957) Jan.

A method is described for obtaining the S^{35} content of biological samples. It is useful for measuring samples containing as little as 10^{-3} to 10^{-4} μc of S^{35}. (W.L.H.)

3491

BURST-SLUG CERENKOV DETECTOR. C. M. Gordon and J. I. Hoover (Nucleonics Div., Naval Research Lab., Washington, D. C.). Nucleonics 15, No. 1, 91-3(1957) Jan.

A possible method for detecting leakage of fission products into a reactor cooling system is presented. It depends on the detection of high-energy electrons from fission products. (W.L.H.)

3492

A COSMIC-RAY GAS ČERENKOV COUNTER WITH ADJUSTABLE VELOCITY THRESHOLD. R. J. Hanson and D. C. Moore (Univ. of Nebraska, Lincoln). Nuovo cimento (10) 4, 1558-64(1956) Dec.

Measurements of performance have been made on a gas Cherenkov counter with CO_2 at a pressure of 13.1 atm as the dielectric radiator. The corresponding index of refraction is 1.00569. Cosmic-ray μ mesons with velocities greater than that of light in the gas were counted with an efficiency of $(86 \pm 2)\%$. Tests indicate that the efficiency for counting μ mesons with velocities less than that of light in the gas is less than 3%. (auth)

3493

PHOTOMETRIC ANALYSIS OF THE TRACKS IN NUCLEAR EMULSIONS. II. EXPERIMENTAL APPARATUS. M. Della Corte. Nuovo cimento (10) 4, 1565-9(1956) Dec. (In Italian)

A simple apparatus for the photometric analysis of the tracks in nuclear emulsions is described. The optically magnified image of a portion of a track is formed on the plane of a slit and parallel to it, after having been reflected by an alluminated (movable) mirror. This mirror is fastened to the moving coil of a d.c. instrument, suitably modified to respond to 50 + 100 Hz a.c. When a.c. is supplied to the coil the image is accordingly displaced sinusoidally in the direction normal to the slit. The variable luminous flux through the slit modulates the output current of a IP21 Photomultiplier. This current is duly amplified and displayed on the y axis of a cathode ray oscillograph, whose x-axis is swept by an a.c. of the same frequency and suitable phase. The photometric profile thus appears on the screen without appreciable deformation. The total magnification is about 20 to 30 thousand times. The working speed is 500 μm of track every hour; the precision of the width measurements is about 2 + 3%. (auth)

3494

α TRACKS IN NUCLEAR EMULSIONS EXPOSED IN AIR WITH A HIGH RADON CONTENT. G. Aliverti, A. De Maio, G. Lovera, and R. Perilli-Fedeli. Nuovo cimento (10) 4, 1580-2(1956) Dec. (In Italian)

3495

ERRORS IN CONSTANT-SAGITTA SCATTERING MEASUREMENTS IN NUCLEAR EMULSIONS. A. J. Herz, R. M. May, and N. Solntseff (Univ. of Sydney, N.S.W., Australia). Nuovo cimento (10) 4, 1623-5(1956) Dec.

It was observed that the distribution of scattering parameters obtained from constant-sagitta scattering meas-

urements was wider than predicted by estimation formulas derived on the basis of Moliere's theory. Therefore, measurements were made to see whether the excess spread can be reasonably attributed to observational and instrumental errors. (B.J.H.)

3496

COINCIDENCE CIRCUIT FOR A SCINTILLATION SPECTROMETER. H. Manifesto and S. Mayo. Publs. com. nacl. energia atomica (Buenos Aires) Misc. No. 3, 3-15 (1956). (In Spanish)

A very simple and stable coincidence circuit for a double coincidence scintillation spectrometer is described. It has a resolving time of 2×10^{-7} sec with a coincidence efficiency of 97%. (auth)

3497

MEASUREMENT OF TOTAL INTENSITIES OF FAST NEUTRONS WITH NUCLEAR PLATES AND ITS APPLICATION TO THE DETERMINATION OF THE ANGULAR DISTRIBUTION OF NEUTRONS FROM THE REACTION Li(d,n)Be. Publs. com. nacl. energia atomica (Buenos Aires) Ser. fis. 1, No. 7, 115-28(1956). (In Spanish)

The nuclear emulsion technique has been used for the development of two methods for determination of fast neutron flux. Both methods consist in counting the recoil protons produced by a radiator exposed to a neutron beam. In one of them, the emulsion itself has been used both as radiator and detector of the protons; in the other one, the radiator was a paraffin block. Both methods have been used for the determination of the angular distribution of neutrons from lithium bombarded with 900 kv deuterons, from the 1-Mev cascade generator of the Comision Nacional de la Energia Atomica. 46 exposures were performed between 0° and ±135° with respect to the deuteron beam. In each exposure the total number of neutrons emitted in that direction with energies between 1 and 15 Mev has been determined. Because of the strong scattering of the neutrons by the materials of the target support, the results depend on the geometrical conditions of exposure. (auth)

3498

VERTICAL FOCUSING OF SPIRAL β SPECTROMETER. V. S. Shpinel and O. Sh. Groĭs. Zhur. Tekh. Fiz. 26, 2259-68(1956) Oct. (In Russian)

Calculations are given for spatial trajectories in spiral β spectrometers which describe the character of the vertical focusing. Experimental studies of the spectrometer focusing properties, carried out by the photographic method, show an existence of sharp focusing, appearing as a narrow line, expanded along the radius. (R.V.J.)

MESONS

3499

ON LEAVING THE WEAK BOND GROUND IN DOUBLE-CHARGE MESON THEORY. I. F. Ginzburg (Lomonosov Moscow State Univ.). Doklady Akad. Nauk S.S.S.R. 110, 535-8(1956) Oct. 1. (In Russian)

It has been confirmed that the systematic application of weak bond theory cannot be used successfully in double-charge meson theory or in any taken at random ratio of charges because the strong impulses take it out of the weak bond ground. Asymptotics of Green's functions for double-charge theory at large impulses were developed. The results can be applied to neutral theory or to symmetric-charge theory. (R.V.J.)

3500

ELECTROMAGNETIC INTERACTION OF μ MESONS. A. Heym, M. Biasutti, and Ch. Haenny. Helv. Phys. Acta 29, 435-7(1956). (In French)

The number of knock-on electrons produced by 450, 800, and 950 Mev μ mesons has been determined with a hodoscope working at heights of 500 m and 3450 m, the secondary effects resulting from bremsstrahlung, direct electron pair production, or nuclear interaction being negligible. (auth)

3501

A PROBABLE EXAMPLE OF THE PRODUCTION AND DECAY OF A NEUTRAL TAU-MESON. W. A. Cooper, H. Filthuth, J. A. Newth, G. Petrucci, R. A. Salmeron, and A. Zichichi (C.E.R.N., Geneva). Nuovo cimento (10) 4, 1433-44(1956) Dec.

A four-pronged event observed in a magnet cloud chamber is described. It is interpreted as the decay in flight of a neutral τ meson according to the scheme $\tau^0 \rightarrow \pi^+ + \pi^- + \pi^0$ with the subsequent decay of the π^0 meson into an electron pair and a γ ray. The τ^0 meson is produced in carbon in a small nuclear interaction which may be a charge exchange reaction ($K^+ + n \rightarrow \tau^0 + p$). The lifetime of the τ^0 meson before decay is about 3×10^{-10} s. Other possible interpretations of the event are discussed and shown to be improbable. (auth)

3502

ON THE Q-VALUE OF THE TAU-DECAY. G. L. Bacchella, A. Berthelot, M. Di Corato, O. Goussu, R. Levi Setti, M. Rene, D. Revel, L. Scarsi, G. Tomasini, and G. Vanderhaeghe. Nuovo cimento (10) 4, 1529-48(1956) Dec.

The Q-value of the τ decay has been determined in photographic emulsions, by a procedure which, using the joint information given by ranges and angles of the secondary particles, excludes the need of a given R-E relation known a priori. The results obtained for statistics of 45 events is: $Q = (74.9 \pm 0.4)$ Mev. An empirical expression for the B-E relation for π mesons valid in the velocity interval $0.27 < \beta < 0.67$ is obtained: $\log [(E/m_\pi c^2) \times 10^3] = 1.649 + 0.566 \log R_{mm} + 0.010 (\log R_{mm})^2$. The standard deviation on the energy derived from a given mean range by this relation is 0.5%. (auth)

3503

ANGULAR CORELATIONS BETWEEN DECAY PLANES OF τ^+-MESONS AND THEIR PRODUCTION GEOMETRY. T. Regge (Univ. of Rochester, N. Y.). Nuovo cimento (10) 4, 1615-17(1956) Dec.

Refer also to abstracts 3519, 3594, 3625, 3626, and 3627.

METEOROLOGY

3504 HW-43127

Hanford Atomic Products Operation, Richland, Wash.
AN IMPROVED RECORDING ANEMOMETER SYSTEM. L. D. Test. Apr. 26, 1956. 10p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The substitution of a CdS photoconductive cell permits simplification of the portable meteorological mast anemometer. The design, circuitry and performance data are given. (T.R.H.)

NEUTRONS

3505 HW-32476

[Hanford Atomic Products Operation, Richland, Wash.]
NEUTRON MEASUREMENTS. William C. Roesch. July 26, 1954. Changed from OFFICIAL USE ONLY Jan. 11, 1957. 6p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

A list is given of standards which will correlate results of various individuals working in neutron dosimetry. Long counter efficiencies and neutron flux to dose conversions are shown in graphical form. (B.J.H.)

3506 LA-1970
Los Alamos Scientific Lab., N. Mex.
DELAYED NEUTRONS: A REVIEW AS OF OCTOBER 1955. G. R. Keepin. Oct. 1955. 54p. Contract [W-7405-eng-36]. $0.35(OTS).

A comprehensive review is given of existing measurements as of October 1955 on the properties of delayed neutrons from various fissionable isotopes. The relation of these measurements to current theory and practice is discussed. (auth)

3507
THEORY OF SPHERICAL SYMMETRY METHOD FOR MEASUREMENT OF THERMAL NEUTRON ABSORPTION. A. M. Ghose and N. K. Ganguly (Bose Inst., Calcutta). Indian J. Phys. 30, 500-18(1956) Oct.

A new method has been developed for measuring the thermal neutron absorption cross section. The method is a variant of the beam attenuation technique. It is an absolute method requiring no standard neutron absorber for calibration. In this method the spherical symmetry of the experimental arrangement has been exploited to balance out the effect of scattering. Detailed examination has been made of the circumstances under which this balancing takes place. Effects of non-radial neutrons, scattering and absorption in the moderator, variation of detector efficiency for scattered neutrons, multiple scattering and absorption processes, thermalization of scattered epithermal neutrons and non-attainment of thermal equilibrium in the moderator have been studied. Possible extension of this method to other energies of neutrons as well as to other types of radiations, have been discussed. (auth)

3508
MULTIPLE NEUTRON INTERACTIONS IN RESONANT FOILS. James E. Draper (Brookhaven National Lab., Upton, N. Y.). Nuclear Sci. and Eng. 1, 522-40(1956) Dec.

Experiments on resonance neutron capture, scatter, or fission are often analyzed with thin-foil approximations, but for reasons of intensity are better performed with foils of intermediate thickness. For aid in analyzing the resulting corrections, the probability is calculated that a neutron at normal incidence on a foil will be scattered and undergo a second interaction in the foil. This probability is averaged over a resonance and is compared to the probability of a first interaction. The extension to multiple interactions is considered. An important effect is the change in cross section because of energy loss in elastic scattering. The Doppler broadening of resonances and the effect of potential scattering are also included. The application to the area analysis of self-indication experiments is emphasized. This general case includes several more restricted cases with resonant detectors and with nonresonant detectors. (auth)

Refer also to abstracts 3475 and 3577.

NUCLEAR PHYSICS

3509 CF-56-12-4
Oak Ridge National Lab., Tenn.
A SEMI-EMPIRICAL EQUATION FOR PAIR PRODUCTION BELOW 5 MEV. C. D. Zerby and H. S. Moran. Dec. 18, 1956. 11p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The cross sections for pair production in the field of the nucleus and the pair production in the field of the electrons for several elements are given, and a comparison is made with some experimental data on the production of electron-positron pairs by gamma rays. (F.S.)

3510 KAPL-M-LGB-12
Knolls Atomic Power Lab., Schenectady, N. Y.
TECHNIQUE FOR DETERMINING THE EFFECTIVE NEUTRON MULTIPLICATION DUE TO BERYLLIUM. L. G. Barrett. Dec. 3, 1956. 8p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

Beryllium samples exposed to neutron irradiation in a reactor core can be analyzed for Li^6, He^4, and H_3 to determine the effectiveness of beryllium as a neutron producer If, in addition, a sample of fuel is removed from a nearby location in the reactor and analyzed for a particular fission product concentration, the ratio of the number of n,2n reactions to the number of fissions may be obtained. These measurements, along with other information obtained from multigroup calculations or foil activation measurements in a critical assembly, can be used to determine the over-all reactivity change brought about by production and absorption of neutrons in beryllium. (auth)

3511
NUMERICAL ANALYSIS OF A UNITARY PARTICLE MODEL. F. A. Kaempffer and Edith M. Kennedy (The Univ. of British Columbia, Vancouver 8, B. C.). Can. J. Phys. 35, 48-54(1957) Jan.

A classical unitary field model describing a family of electrically uncharged heavy particles is analyzed numerically. A reasonable mass spectrum is obtained. Limitations of the model are stated. (auth)

3512
INTERNAL MATERIALIZATION IN THE ELECTRIC MONOPOLE TRANSITION $0^+ \rightarrow 0^+$ IN Zr^{90}. Tosiko Uasa, Jeanne Laberrigue-Frolow, and M. Louis Feuvrais. Compt. Rend. 243, 2045-7(1956) Dec. 17. (In French)

Experimental research on the β^+ spectrum due to internal materialization in the $0^+ \rightarrow 0^+$ transition in Zr^{90}, during the disintegration of Y^{90}, is discussed. Observation of the e^+ spectrum ($N_{\beta^+}/N_{\beta^-} = (5.4 \pm 0.8) \times 10^{-5}$) using a thick magnetic lens spectrograph confirms the existence of this transition. (tr-auth)

3513
MEAN FREE PATH FOR DIRECT PRODUCTION OF ELECTRON PAIRS BY ELECTRONS FROM 1 TO 100 Bev. R. Weill, M. Gailloud, and Ph. Rosselet. Helv. Phys. Acta 29, 437-41(1956). (In French)

The mean free path for direct electron pair production by 2 to 8, 8 to 32, and 50 to 150 Bev electrons has been measured in Ilford G 5 emulsion. The obtained values are less than those foreseen by theory. (auth)

3514
STUDIES OF ANGULAR DISTRIBUTIONS OF γ QUANTA DURING POSITRON ANNIHILATION IN VARIOUS MATERIALS. K. A. Baskova and B. S. Dzhelepov. (Zhdanov Leningrad State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 951-5(1956) Aug. (In Russian)

Scintillation counters with NaI(Tl) crystals and schemes of coincidences with resolving time of 5×10^{-8} sec were used to determine the angular distribution curves for the γ quanta during the annihilation of positrons in various materials. The experimental geometrical measurements using Cu^{64} as the positron source with Be or Pb targets and the curves of the angular distribution of γ quanta in positron absorption in Pb ampoules with Cu^{64} source and in Be and Pb are presented. Results obtained for Be and Pb, quantitatively, coincided with results of G. Lang et al. Phys. Rev. 99, 596(1955), however, the width ratio for the Be angular distribution to the width of Pb curve on the half height was obtained as 1.2 while in Lang's work it was shown as 1.16. With the increase of fermion energy in metals, the width of the angular distribution curve for the

annihilated γ quanta increases too. For Be, the curve is wider than in the other investigated metals because of larger fermion energy of its electrons (14 ev). In K, Na, and Li, the fermion energy equals 2 to 4 ev, while in Pb it is approximately 10 ev. The difference in the angular distribution indicates the important part the electron velocities play in the annihilation process. (R.V.J.)

3515

POSITRONIUM FORMATION IN GASES. Vernon W. Hughes (Yale Univ., New Haven, Conn. and Columbia Univ., New York). J. Appl. Phys. 28, 16-22(1957) Jan.

The formation of positronium in gases can be investigated by observing the energy spectrum of the annihilation radiation. The increase in positronium formation due to a static electric field has been measured in various gases. For the rare gases the increase has a sigmoid dependence on the ratio of electric field to pressure. The fraction of the positrons that form positronium increases by a maximum factor of 1.5, 1.4, and 2.1 for He, Ne, and A, respectively. A similar increase was observed for H_2, D_2, and N_2. No effect of the electric field was found in the polyatomic gases CO_2, CH_4, C_2H_6, and CCl_2F_2, but a small anomalous decrease in positronium formation was seen in SF_6. The increase in positronium formation occurs in the presence of an electric field because low energy positrons, which die by direct annihilation with atomic electrons without positronium formation in the absence of an electric field, can gain energy from the electric field to cross the threshold energy for positronium formation in the gas. A theory based on the Boltzmann equation describes the behavior of the positrons under the combined influence of the electric field and molecular collisions, and provides the basis for obtaining from the observed data values of the elastic scattering cross section of positrons by the rare gas atoms. The cross sections are $0.023\pi a_0^2$, $0.12\pi a_0^2$, and $1.5\pi a_0^2 \pm 25\%$ for He, Ne, and A, respectively. Quantitative interpretation for the polyatomic gases is more difficult. An optical search for the 2430 A Lyman line from positronium is described. (auth)

3516

ROTATIONAL STATES OF SPHERIODAL NUCLEI. F. Coester (State Univ. of Iowa, Iowa City). Nuovo cimento (10) 4, 1307-15(1956) Dec.

A new method of introducing collective coordinates as dynamical variables is proposed. A Hamiltonian for rotating spheroidal nuclei is constructed by this method. The resulting moments of inertia are discussed. They depend on a parameter ξ which is determined if the intrinsic particle wave function of the nucleus is known. If ξ is treated as an empirical parameter the observed moments of inertia can be fitted. In order to illustrate the theoretical determination of ξ, calculations have been carried out for independent particles in a harmonic oscillator well without spin-orbit coupling. (auth)

3517

ON THE SOLUTIONS OF THE FLUCTUATION PROBLEM IN CASCADE SHOWERS. H. Messel (Univ. of Sydney, N. S. W.). Nuovo cimento (10) 4, 1339-48(1956) Dec.

A practical method of obtaining numerical results in special cases for the number distribution function in shower theory is considered. It is also shown that Lopuszanski's and Moyal's recent solutions of the number distribution function equations are only formal expansions of these functions in terms of their factorial moments. (auth)

3518

ON THE TRIDENT CROSS-SECTION BETWEEN 1 AND 10 GeV. F. A. Brisbout, C. Dahanayake, A. Engler, and D. H. Perkins (Univ. of Bristol). Nuovo cimento (10) 4, 1498-1503(1956) Dec.

An estimate has been made of the trident cross-section for electrons of energy between 1 and 10 Bev. Energy determinations were made by scattering measurements on each track under conditions where the effects of spurious scattering have been shown to be negligible. In a total track length of 219 cm, the estimated number of true tridents was found to be 3, as compared with 2.4 expected from theory. Even on the basis of this small number of events, there is a marked discrepancy between our results and those of previous experiments at high energies. Reasons for this discrepancy are discussed. (auth)

3519

WEAK DIRECT BOSON-LEPTON INTERACTIONS AND DISINTEGRATIONS OF K MESONS. R. d'Espagnat and J. Prentki (CERN, Geneva). Nuovo cimento (10) 4, 1572-4 (1956) Dec. (In French)

3520

CALIBRATION OF A Ra-Be SOURCE. A. H. W. Aten, Jr. and V. J. Kowalewski. Publs. com. nacl. energia atomica (Buenos Aires) Ser. fis. 1, No. 10, 189-201(1956). (In Spanish)

The number of neutrons emitted per second and in all directions by a source of 50 mg. of radium with beryllium was determined by the manganese bath method. The problem of the absolute measurement of the low activity of manganese was solved by means of an intermediate activity. The correction due to the finite volume was calculated on the basis of already published neutron distribution curves in water. The result obtained was: $Q = (5.0 \pm 0.5) \times 10^5$ n/sec. (auth)

3521

STUDY OF NUCLEAR STRUCTURE BY ELECTROMAGNETIC EXCITATION WITH ACCELERATED IONS. K. Alder, A. Bohr, T. Huus, B. Mottelson, and A. Winther (Univ. of Copenhagen, Denmark). Rev. Mod. Phys. 28, 432-542(1956) Oct.

The theory of electromagnetic excitations is reviewed, including the classical and quantum mechanical theories. Results of numerical computations of excitation cross sections and γ distributions are included. Higher order excitation effects are also briefly discussed. The conditions for experimental investigation of the Coulomb excitation process are considered. Experimental results are analyzed and compiled. Collective nuclear excitations are also discussed. (B.J.H.)

3522

SPATIAL DISTRIBUTION OF THE CHARGE AND "ELECTRIC RADII" OF HEAVY NUCLEI. G. F. Drukarev. Uspekhi Fiz. Nauk 60, 391-412(1956) Nov. (In Russian)

Review is given of the experimental and theoretical data describing the values for heavy nuclei "electric radii" and clarifying some details of the spatial distribution of nuclear charge. The theory of electron scattering, the Coulomb energy for heavy nuclei, effects in atomic spectra, and μ-meson x rays are included in the review. (R.V.J.)

Refer also to abstract 3442.

NUCLEAR PROPERTIES

3523 HARD(A)/N-20

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

NUCLEAR DATA FOR H.A.R. SYSTEMS. P. N. Cooper. Dec. 12, 1956. 14p.

The best presently available nuclear data for various reactor materials are summarized. Neutron cross sections are tabulated for fissile materials, core and blanket

absorbers, and blanket materials at 2200 m/s neutron velocity and at a mean operating temperature of 265°C. (B.J.H.)

3524 UCRL-3538

California. Univ., Berkeley. Radiation Lab.
RADIOACTIVITY OF INDIUM-109 AND TIN-109 (thesis). Michael D. Petroff. Oct. 2, 1956. 58p. Contract W-7405-eng-48. $9.30(ph OTS); $3.60(mf OTS).

An investigation of the β and γ radiations from the 4.3-hour radioactive isotope In^{109} has been made with a magnetic-lens beta-ray spectrometer. On the basis of the observed positron spectrum and the measurement of the conversion coefficients of the more intense γ rays a decay scheme for In^{109} is proposed. The spins and parities of the levels of Cd^{109} that are involved in the decay scheme are discussed in relation to the known levels of Cd^{111}. The investigation included the measurement of the half life of a 58-kev isomeric transition in Cd^{109} which yielded a value of $12 \pm 3 \times 10^{-6}$ second. The investigation of the products of α-particle bombardment of cadmium enriched in Cd^{106} has resulted in the assignment of an 18-minute electron capture and positron and γ activity to the isotope Sn^{109}. The information obtained on the radioactivity of this isotope is discussed with reference to the occurrence of isomerism among odd-nucleon-number indium isotopes. (auth)

3525

NUCLEAR ISOMERISM IN ODD LEAD ISOTOPES. R. Stockendal, J. A. McDonell, M. Schmorak, and I. Bergström. Arkiv Fysik 11, 165-88(1956).

In milking experiments the isomers of Pb^{199}, Pb^{201}, and Pb^{203} were obtained from their corresponding bismuth parents. In Pb^{205} no isomeric transition was observed. The isomers were studied by means of scintillation spectrometers, double-focusing β spectrometers, and a permanent magnet β spectrometer for photographic recording. The following half lives and transition energies were found: Pb^{199m}: $T_{1/2} = 13 \pm 1$ min, $E_\gamma = 410 \pm 30$ kev; Pb^{201m}: $T_{1/2} = 61 \pm 2$ sec, $E_\gamma = 629 \pm 1$ kev; Pb^{203m}: $T_{1/2} = 6.5 \pm 0.5$ sec, $E_\gamma = 825.2 \pm 0.5$ kev. The isomeric transitions were shown to be M4 transitions. Only one gamma ray was found in each decay. Therefore $f_{1/2}$ ground states for Pb^{199}, Pb^{201}, and Pb^{203} are suggested. Odd lead isomers were shown to exhibit a systematic trend in half lives and energies. The matrix elements of the M4 transitions in the odd lead isomers were found to be remarkably constant. (auth)

3526

HALF-LIFE DETERMINATION OF SOME RADIONUCLIDES. W. F. Merritt, P. J. Campion, and R. C. Hawkings (Atomic Energy of Canada Limited, Chalk River, Ontario). Can. J. Phys. 35, 16-20(1957) Jan.

The half lives of the following nuclides have been determined by absolute counting techniques using a 4π beta proportional counter. The period over which the observations were made is indicated in brackets. The errors quoted are the statistical counting errors. Results give: Na^{22}—2.58 ± 0.03 years (2 years); Ru^{106}—1.02 ± 0.01 years (5 years); Cs^{134}—2.19 ± 0.02 years (5 years); Ce^{144}—285 ± 2 days (4 years); Pm^{147}—2.64 ± 0.02 years (4 years); and, Tl^{204}—3.56 ± 0.05 years (4 years). A review of previous determinations is included. (auth)

3527

HALF LIFE OF THE 396-kev LEVEL OF Lu^{175} Hamlet Vartapetian. Compt. rend. 244, 65-8(1957) Jan. 2. (In French)

By the method of delayed coincidences, it is shown that the 396-kev level has a half life of $T_{1/2} = (3.4 \pm 0.3) \times 10^{-9}$ s. (auth)

3528

TOTAL CROSS SECTIONS FOR THE INTERACTION OF 650 MEV PROTONS WITH NUCLEI. V. I. Moskalev and B. V. Gavrilovskiĭ. (Inst. of Nuclear Problems). Doklady Akad. Nauk S.S.S.R. 110, 972-4(1956) Oct. 21. (In Russian)

Total cross sections for the interactions of 650-Mev protons with Be, C, O, Al, Cu, Sn, Pb, and U nuclei were measured with a synchrocyclotron using the methods previously used by V. P. Dzhelepov et al, (Doklady Akad. Nauk S.S.S.R. 104, 380(1955)) for total cross sections of (p,p) and (p,d) interactions. The table is given showing the values of the total cross sections. σ_t and cross sections of inelastic interaction σ_a. Interpolations of the values obtained for σ_t from the available values for protons with 315 to 408 Mev showed that the cross sections for light nuclei increase about 10 to 20% with proton energies up to 650 Mev. The cross sections of inelastic interactions measured for 134-Mev protons coincide within limits of error with cross sections at 650 Mev. The cross sections for the inelastic interaction of 860-Mev protons with Be, C, and Al, also coincide, with the obtained data, while for the heavy nuclei of 860 Mev the cross section is attenuated about 10%. The radii for nuclei R were determined on the basis of the σ_a values. R values for all nuclei from Be to U lay on the straight line $R = r_0 A^{1/3}$ where $r_0 = (1.37 \pm 0.03) \times 10^{-13}$ cm. From the relation $\sigma_a / \pi R^2$, it is seen that the heavy nuclei are almost non-transparent for protons of the above energies, while the light nuclei show a considerable transparency (~25%). (R.V.J.)

3529

LEVEL SCHEME OF Ta^{181}. P. Debrunner, E. Heer, W. Kündig, and R. Rüetschi. Helv. Phys. Acta 29, 463-5 (1956). In German)

By means of angular correlation methods the decay of $Hf^{181}-Ta^{181}$ has been studied. Spins and parities of all levels are discussed and compared with the predictions of the unified model. The angular correlation of the main γ-γ-cascade (133 kev—482 kev) has been investigated using cubic crystalline, liquid and gaseous sources. The angular correlation of two other cascades, inseparable in energy by scintillation techniques, are measured making use of the different attenuation in various sources. The magnetic moment of the 482-kev level has been determined, taking into account the attenuation effects in liquids. All experimental data, including Coulomb excitation and the decay of W^{181} are summarized. (auth)

3530

STUDY OF NUCLEAR EVAPORATION IN Ag AND Pt BY SANDWICH EMULSIONS. Cl. Zangger and J. Rossel. Helv. Phys. Acta 29, 507-32(1956). (In French)

The technique of sandwiching metal foils of different elements between nuclear emulsions is analyzed in its application to the study of nuclear evaporation induced by cosmic rays in Ag and Pt at 3600 m above sea level. The characteristics of the star size distributions and of the nuclear evaporation in the two elements are investigated with special emphasis on the anomalies in the energy spectrum of the emitted α particles. Theoretical interpretations are discussed. (auth)

3531

DEFORMATION EFFECTS ON THE FORMATION OF ISOMERIC STATES IN NUCLEI. L. K. Peker. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 956-61(1956) Aug. (In Russian)

Isomeric states in nuclei with odd A have been analyzed within the frame of generalized shell models. The experiments were limited to the study of isomeric states whose long life was based on the difference in spin $\Delta I \geq 3$. The investigation was made with a single-particle model in which the multiple isomeric γ transitions related to the M4 type

in which the transitions occurred between the states of $g_{9/2} \rightleftharpoons p_{1/2}$, $h_{11/2} \rightleftharpoons d_{3/2}$; $i_{13/2} \rightleftharpoons f_{5/2}$, and in a few cases they appeared in type E3 with transitions $h_{11/2} \rightleftharpoons d_{5/2}$; out of 90 cases only 3 to 4 were in isomeric transitions of other types: M3 and E4. However, detailed analyses of the isomeric states in the single-particle model was met with serious complications which were resolved without additional assumptions by considering the nuclear deformations which resulted in a satisfactory description of isomeric transitions in nuclei of odd A. (R.V.J.)

3532

ABOUT THE LEVELS OF NUCLEI WITH ODD NUMBER OF NEUTRONS Z = 11 TO 28. A. M. Demidov. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 962-6(1956) Aug. (In Russian)

A scheme of single-particle neutron levels for certain even-odd nuclei distributed in the exact order predicted by the nuclear shell model: $1d_{5/2}$, $2s_{1/2}$, $1d_{3/2}$, $1f_{7/2}$, $2p_{3/2}$, $1f_{5/2}$, and $2p_{1/2}$ was studied. Additional data were obtained from the analysis of energetic levels of nuclei with the same neutron configuration, but with a different number of protons. Cases where the number of protons changes to unity were studied and comparisons were made of the excited states of even-odd and odd-odd nuclei. (R.V.J.)

3533

ON THE EXISTENCE OF OCTUPOLE ISOMERIC TRANSITIONS WITH HALF-LIFE $T_{1/2} = \sim 10^{-4}$ sec. IN NUCLEI WITH ODD A NUMBERS. V. I. Gol'danskiĭ and V. S. Evseev (Lebedev Inst. of Physics). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 967-72(1956) Aug. (In Russian)

Discussions are offered on transitions, spins, and energy levels in odd A. Illustrations are given of possible octupole transitions of nuclei with N, Z = 21 to 50; N, Z = 51 to 82; and, N, Z = 83 to 126, and the schemes of nuclear excited states at various levels for Rb^{103}, Lu^{175}, and Au^{197} are presented. (R.V.J.)

3534

BINDING ENERGIES OF THE LIGHT HYPERFRAGMENTS. J. T. Jones, Jr. and J. M. Keller (Iowa State College, Ames). Nuovo cimento (10) 4, 1329-38(1956) Dec.

The purpose of the present paper is to determine the constants of a phenomenological potential assumed for the Λ^0-nucleon interaction by fitting them to the observed binding energies of the mass 3 and 4 hyperfragments. Variational calculations have been carried out for these hyperfragments and hyperhelium-5. The calculations indicate that the Λ^0-nucleon force is strongly spin dependent, and also that the hypertrineutron and hyperhelium-3 are not bound. The chief assumptions that have been made are: (a) the spin of the Λ^0 is $\frac{1}{2}$; (b) the hyperdeuteron is not bound; (c) the Λ^0-nucleon interaction arising from the virtual exchange of heavy mesons may be represented by the assumed phenomenological potential (any possible pion admixture resulting from the virtual exchange of at least two pions between the Λ^0 and nucleon being neglected); (d) all but the principal S-states of the hyperfragments with mass numbers less than or equal to five may be neglected; (e) the nucleon-nucleon interaction is represented by the central Yukawa interaction. The last three assumptions are rather severe and imply that the present calculations are to be considered as preliminary to a more complete investigation, in which the tensor interaction between nucleons and also the pion admixture of the Λ^0-nucleon force are included. (auth)

3535

CONFIRMATION OF THE HALF LIFE OF THORIUM 232. E. Picciotto and S. Wilgain. Nuovo cimento (10) 4, 1525-8 (1956) Dec. (In French)

The half life of Th^{232} is deduced from the Th^{228} activity measured by successive disintegration stars in nuclear emulsions. The period was found to be 1.39×10^{10} years with a relative dispersion of 2%, in good agreement with the value of Kovarik and Adams. (tr-auth)

3536

A SEMI-EMPIRICIAL FORMULA FOR α-DISINTEGRATION ENERGY IN THE REGION OF RARE-EARTH NUCLIDES. M. K. Rama Swamy (The Johns Hopkins Univ., Baltimore). Nuovo cimento (10) 4, 1570-1(1956) Dec.

A semi-empirical formula for α disintegration energy was found to be $E_\alpha = 0.36\ Z - 1.19(N-82)^{\frac{1}{2}} - 17.89$ for $N > 82$, $Z < 82$ where E_α is the α disintegration energy, Z is the proton number, and N the neutron number. (B.J.H.)

3537

RADIATIONS FROM ^{66}Ge AND ^{67}Ge. R. A. Ricci and R. van Lieshout. Nuovo cimento (10) 4, 1592-3(1956) Dec.

In order to clarify questions concerning the decay of Ge isotopes, an investigation was made of the Ge^{66} and Ge^{67} isotopes produced from chemically pure Zn irradiated with 52-Mev α particles in the cyclotron. Gamma scintillation counters were used to investigate the radiations, and the results are tabulated. (B.J.H.)

3538

ON THE SPIN AND PARITY OF THE FIRST EXCITED STATE OF ^{19}O. R. V. Popić. Nuovo cimento (10) 4, 1597-8(1956) Dec.

An attempt was made to derive the spin and parity of the first excited state of O^{19} utilizing data on the angular distribution of the stripping reaction $O^{18}(d,p)O^{19}$. The Tobocman theory of stripping was applied. (B.J.H.)

3539

STUDY OF A LOW-INTENSITY COMPONENT IN THE β-RAY SPECTRUM OF $^{214}_{83}$Bi(RaC). G. R. Bishop and F. Demichelis. Nuovo cimento (10) 4, 1599-1600(1956) Dec.

Since an examination of the β spectrum of Bi^{214} with a magnetic spectrograph showed no trace of a 2.56-Mev β ray, a further search was made for the β ray using a proportional scintillation counter. The counter consisted of a cylinder of plastic phosphor with a central conical hole into which the β rays were collimated with Al stops. The experimental data demonstrate conclusively the existence of the 2.56-Mev β ray. (B.J.H.)

3540

DISPERSION RELATIONS FOR DECAY PROCESSES. E. Corinaldesi (The Univ. of Glasgow). Nuovo cimento (10) 4, 1605-7(1956) Dec.

It is shown that the amplitudes for decay processes satisfy dispersion relations analogous to those of scattering. This is true of any reaction in which a particle disappears and at least three other particles are produced. This is illustrated by application to the decay of the τ meson into 3 π mesons. (B.J.H.)

3541

RADIATIVE CAPTURE OF PROTONS OF LESS THAN 1 MEV IN BERYLLIUM. A. B. Clegg (Cavendish Lab., Cambridge). Phil. Mag. 1, 1116-25(1956) Dec.

Descriptions are given of the γ rays produced by the radiative capture of protons in Be. It is shown that the yield for protons of less than 1 Mev is due to two broad resonances at 995 and 330 kev. The γ radiation from the 330-kev resonance was investigated in detail. (B.J.H.)

3542

DETECTION OF THE 40-kev γ RAY FROM ThC″ WITH SCINTILLATION COUNTERS IN TRIPLE COINCIDENCE. Horacio E. Bosch. Publs. com. nacl. energia atomica (Buenos Aires) Ser. fis. 1, No. 9, 167-88(1956). (In Spanish)

The nucleus of ThC″ presents an important feature due to

the fact that it is constituted by a double closed shell with a proton hole and an excess neutron. Only the detection of the 40-kev γ radiation which corresponds to the first excited state was attempted. For this purpose a double spectrometer, using scintillation counters as detectors was mounted in coincidence. A fast coincidence circuit, an energy coincidence circuit, and a triple coincidence circuit were used. A coincidence spectrum was found. A description of the apparatus is given in an appendix. (auth)

Refer also to abstracts 3371, 3407, and 3631.

NUCLEAR REACTORS

3543 AERE-RS/R-2092

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

MEASUREMENTS OF THE CHANGE IN CROSS SECTION OF IRRADIATED URANIUM MADE BY MODULATING THE POWER OF A NUCLEAR REACTOR (thesis). D. J. Littler. Nov. 6, 1956. 92p.

The mechanism of the modulation of the power of a nuclear reactor by the periodic insertion and removal of a neutron absorber is discussed. A description is given of the way in which a reactor oscillator can be used for the measurement of neutron absorption cross sections, and of the construction of such an oscillator in the GLEEP at Harwell. An account of the statistical fluctuations in a reactor and their effect on the accuracy of neutron absorption cross section measurements is summarized. The theory of long-term reactivity changes in a thermal neutron power reactor due to the build-up of Pu^{239} and fission products, and the destruction of U^{235}, is discussed, and it is shown that an assessment of such long-term changes from a knowledge of the fundamental nuclear constants for Pu^{239}, U^{235}, is difficult because the accuracy to which the constants are known is not sufficiently high. A description is given of cross-section measurements made on uranium bars both before and after irradiation in order to make long-term reactivity change predictions. From these measurements, a new and independent value for the fission yield of Sm^{149} is obtained. (auth)

3544 ANL-WHZ-250(Del.)

Argonne National Lab., Lemont, Ill.

A REPORT TO THE ATOMIC ENERGY COMMISSION ON THE PROPOSED CP-3 REACTOR. June 15, 1950. Decl. with deletions Oct. 11, 1955. 75p. Contract W-31-109-eng-38. (M-5727). $15.30(ph OTS); $5.40(mf OTS).

A complete description is given of the CP-3 reactor, a heavy water cooled and moderated reactor. Potentially hazardous features of the reactor are enumerated and evaluated. A study of the effect of the presence of steam bubbles on the reactivity of CP-3' is included in an appendix. Complete diagrams of the reactor are also included. (B.J.H.)

3545 BNL-421

Brookhaven National Lab., Upton, N. Y.

THE DETERMINATION OF POWER AND TEMPERATURE OVERSHOOT IN THE REACTOR FLASH PROBLEM. K. T. Spinney. Nov. 1956. 18p. $0.20(OTS).

An attempt is made to calculate the actual quantitative values of physical quantities such as the maximum temperature and power overshoots in reactors and the time to reach the maxima. A simplified treatment is first considered, in which the effects of delayed neutrons are neglected. These results are then compared with those which may be obtained when they are included. (B.J.H.)

3546 CF-56-12-82

Oak Ridge National Lab., Tenn.

NUCLEAR CHARACTERISTICS OF TWO-REGION SLURRY REACTORS. M. W. Rosenthal and M. Tobias. Dec. 20, 1956. 60p. Contract [W-7405-eng-26]. $9.30(ph OTS); $3.60(mf OTS).

Nuclear characteristics were computed for over 400 two-region spherical homogeneous reactors having D_2O–ThO_2–$U^{233}O_2$ slurry in both core and blanket. Curves are presented of breeding ratio, core-wall power density, critical concentration, critical ratio, and blanket power as functions of various design parameters. Neutron balances and additional characteristics are given for 10 representative reactors. A simple method for estimating the effects of core and blanket poisons on breeding ratio and critical concentration is described. (auth)

3547 CF-56-12-115

Oak Ridge National Lab., Tenn.

PRELIMINARY SOLIDS-INJECTION EXPERIMENTS ON THE HRT MOCKUP AT Y-12. J. R. Engel. Dec. 18, 1956. 10p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80 (mf OTS).

Experiments are described in which solids as sulfates and oxide corrosion products were introduced into the HRT mockup. Removal of the solids with a hydroclone was studied. (T.R.H.)

3548 CRHP-677

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

REACTOR SITING, THE EXCLUSION AREA CONCEPT AND AN ALTERNATIVE APPROACH. G. W. C. Tait. Oct. 1956. 34p. (AECL-388).

The value of siting a reactor in an area of limited public access is considered. The distance to which likely injury or damage will extend as a result of a major reactor disaster is found to depend greatly on meteorological conditions. Many published recommendations for safety, underestimate the distance to which hazards may reach under commonly occurring weather situations. An exclusion area of sufficient extent to include all regions subject to hazards of public concern under a range of likely weather conditions would be very large. To attempt to meet public responsibility by siting a reactor in such an area would impose a serious burden on the economy of the community. As an alternative approach it is shown that while a true exclusion area would be very large, the area and extent of damage associated with an actual disaster is definitely limited. It is, therefore, proposed that the acceptance of a limited hazard should be the basic principle in reactor siting. The aim is to achieve an acceptable balance between the maximum possible damage, the likelihood of disaster and the value of the reactor to a community Maximum permissible escapes of activity are recommended for a variety of situations. Reactor design to hold escape to these limits should not be very difficult. (auth)

3549 CRRP-662

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

THE SPECIFICATION OF NEUTRON FLUX AND EFFECTIVE CROSS SECTIONS IN REACTOR CALCULATIONS C. H. Westcott. Aug. 15, 1956. 16p. (AECL-352)

This report arises from discussions of an interim report (RPI-11) in the Tripartite Cross-Sections Committee and at Harwell in July 1956. It incorporates conclusions and a notation agreed with the British which it is hoped will receive a measure of general acceptance. In some details (e.g., the notation δ) there is room for differences in practice, but it is hoped that the term written as "g +

rs" will be generally adopted for work where the assumption of a Maxwellian plus a dE/E component of the neutron flux spectrum is an adequate approximation. The principal conclusion of this report is that the value to be used generally for the neutron flux is the "2200 m/sec flux" (nv_0), the "true" flux ($\bar{nv}$) being introduced only in work involving detailed use of diffusion or transport theory. Effective cross section values can be chosen to correspond with either choice ($\hat{\sigma}$ with nv_0 and $\bar{\sigma}$ with $\bar{nv}$), so that for general use it is $\hat{\sigma}$ that is preferred. For a Maxwellian distribution of neutron velocities, $\bar{\sigma}$ can readily be obtained from $\hat{\sigma}$ if required. The "f-factor" of BNL-325 is to be replaced in future tripartite committee tabulations by a "g-factor," defined by $\hat{\sigma} = g\sigma_0$, since the value $\hat{\sigma}$ is likely to be much more widely used than either $\bar{\sigma}$ or the f(KT)σ(kT) of BNL-325. For reactor spectra which approximate to a Maxwellian (T°K) plus a dE/E flux component (suitably terminated at the low energy end, say at μkT), a new spectral index is introduced, the epithermal ratio r, given by $r = \beta/(1 + 4\beta/\sqrt{\pi\mu})$ to replace the β (λ in the U.K.) formerly used. This is used with a quantity s, simply related to the resonance integral, to give the result $\hat{\sigma} = \sigma_0(g + rs)$ for reactor spectra, g and s being functions of T which will be tabulated for important reactions. (auth)

3550 DR-39

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

LOW COST FUELLING WITHOUT RECYCLING. W. B. Lewis. Dec. 10, 1956. 56p. (AECL-382).

It appears that it is practicable to design a power reactor to operate on natural U fuel and obtain an energy yield of 10,000 Mwd/T without reprocessing. No detailed design of a suitable reactor has been carried through, but the reactor is envisaged as having a core of U metal or oxide fuel slugs lying in horizontal pressurized channels surrounded by heavy water moderator and reflector. Fuel slugs are introduced from opposite ends of adjacent channels and advanced through the reactor by one slug length at a time. Thus new fuel in one channel lies close to fuel nearing the end of its irradiation in an adjacent channel. The reactor is large enough to have low neutron leakage. The average neutron flux is kept down to about 3×10^{13} n/cm^2/sec. If uranium fuel can be supplied to the reactor at $40/kg, the fuel supply cost would be less than 0.7 mill/kwh. (auth)

3551 DTMB-1030

David W. Taylor Model Basin, Carderock, Md.

FLEXIBLE TRANSPORT THEORY ROUTINES FOR NUCLEAR REACTOR DESIGN. Erwin H. Bareiss. Dec. 1955. 77p.

Methods for the numerical solution of the one-dimensional one-energy transport equation are investigated and compared. Several flexible transport theory routines that have been coded for the Naval Ordnance Research (NORC) are described in the Appendixes. These codes are currently used by the Westinghouse Atomic Power Division in their nuclear reactor design program. The multienergy cases are treated in a separate report. (auth)

3552 HW-43744

[Hanford Atomic Products Operation, Richland, Wash.]

EFFECTS ON THE INHOUR EQUATION FOR REACTORS FUELED WITH MIXTURES OF FISSIONABLE MATERIAL. E. R. Astley. June 15, 1956. 5p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The differences in pile neutron behavior due to the smaller fraction of delayed neutrons per fission of Pu^{239} and the larger fraction of delayed neutrons per fast fission of U^{238} than occurs from fission of U^{235} alone were studied. (F.S.)

3553 KAPL-M-EDL-124

Knolls Atomic Power Lab., Schenectady, N. Y.

S2G VALVE SODIUM FREEZE SEAL EVALUATION. PHASE II. P. K. Salzman and F. N. Schell. Nov. 20, 1956. 50p. Contract W-31-109-Eng-52. $7.80(ph OTS); $3.30(mf OTS).

The design of the S2G 8-inch sodium stop valve freeze seal was evaluated under established conditions by cycling before and after a simulated bellows failure. The effectiveness of the freeze seal under severe ambient, water flow, and insulation conditions was also evaluated. The stop valve operated successfully under all test conditions. (auth)

3554 KAPL-M-JMG-7

Knolls Atomic Power Lab., Schenectady, N. Y.

EXAMINATION OF S1G SODIUM STOP VALVE BELLOWS. J. M. Gerken. Jan. 4, 1957. 9p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

Two 8-in. Na stop valve bellows were endurance tested and an evaluation was made of the bellows welds. Mass spectrometer leak testing of these bellows indicated that they were leak tight. A 2-in. Na stop valve bellows which leaked at a point on one of the outer welds was examined for the cause of leaking. The weld in the region of the leak was found to be severely oxidized internally, indicating that the flow of inert shielding gas failed momentarily during welding. (B.J.H.)

3555 KAPL-M-SMS-36

Knolls Atomic Power Lab., Schenectady, N. Y.

PRELIMINARY EVALUATION OF HIGH TEMPERATURE PURIFICATION METHODS FOR S3G/S4G. Robert J. Brandon. Aug. 10, 1956. 34p. Contract W-31-109-Eng-52. $6.30(ph OTS); $3.00(mf OTS).

A preliminary evaluation of high temperature purification methods, as they apply to the primary water purity of S3G/S4G, has been made. The evaluation includes a consideration of purification by hydroclones, magnetite bed filtration and continuous dilution. The data utilized consists of what is considered to be the most applicable and reliable presently available from literature as well as that furnished by direct communication with groups presently engaged in testing the proposed methods. (auth)

3556 KAPL-M-SMS-50

Knolls Atomic Power Lab., Schenectady, N. Y.

S3G/S4G REACTOR HEAD STANDPIPE REGION PROBLEMS. T. H. Glasser. Dec. 14, 1956. 21p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

The maximum axial bending stress in a break in gradient in the shortest standpipe between head and flange and the temperature distribution and maximum axial bending stress for exponential temperature distribution in a standpipe with a 9-in. length between head and stovepipe were studied and compared to previous results for thermal gradients and stresses in the standpipe for the Submarine Advanced Reactor. (F.S.)

3557 NAPLES-UK-6

[Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England].

THE PLACE OF THE SODIUM GRAPHITE REACTOR IN THE U.K. NUCLEAR POWER PROGRAMME. J. M. Hill and F. W. Fenning. [1956?]. 4p.

The relative advantages and disadvantages of the sodium graphite reactor compared with gas cooled systems in reactors for producing electricity reasonably are listed and evaluated. (F.S.)

3558 TID-7007(Pt. 1)

Division of Reactor Development, AEC.

COMPILATION OF ORGANIC MODERATOR AND COOL-

ANT TECHNOLOGY. Jan. 24, 1957. 254p. $1.25(OTS).

A large portion of the technology of organic reactor moderators and coolants which has been presented in various reports and documents is compiled. Papers are included on the effects of γ radiation on non-metallic materials, organic coolant studies, current research on high-temperature liquids, the effects of structure and functional groups on the radiolysis of organic compounds, radiation effects on the stability of organic fluids, radiation damage in organic polymers, temperature effects on the radiation stability of aromatic hydrocarbons, the stability of biphenyl under 1-Mev electron irradiation, an analysis of the use of an organic moderator in a liquid Na cooled power reactor, an engineering analysis of organic coolants in power reactors, the melting points and viscosities of mixtures of diphenyl with its pyrolysis products, organic materials as reactor coolants and moderators, the stability of diphenyl, the evaluation of viscosity as a measure of pyrolytic and radiolytic damage in organic compounds, organic pump loops, and the explosibility of diphenyl dust and Santowax R powder. (B.J.H.)

3559

FRENCH ATOMIC DEVELOPMENTS. Atomics 8, 15-19 (1957) Jan.

The French atomic power program is described. Existing facilities and those planned for the immediate future are discussed. (C.H.)

3560

REACTOR TECHNOLOGY FOR THE ENGINEER—I FISSION PROCESSES. P. A. Egelstaff (Atomic Energy Research Establishment, Harwell). Atomics 8, 21-4(1957) Jan.

During the past few years fission physics has developed rapidly both experimentally and theoretically. Of particular interest to those concerned with reactors are the developments in our understanding of slow neutron fission cross-sections and of the neutron yield from fission. These aspects of the fission process are described in this article. (auth)

3561

THE SWIMMING POOL REACTOR AT TROMBAY. R. Ramanna (Atomic Energy Establishment, Bombay). J. Sci. Ind. Research (India) 15A, 432-8(1956) Oct.

3562

COMPARISON OF THE INDUSTRIAL DESIGNS. Nuclear Eng. 2, 5-9(1957) Jan.

The designs of four industrial groups for power producing reactors based on the Calder Hall reactors are discussed. The four groups propose a heat output of more than 500 Mw. The most significant advance in the designs is the introduction of fuel changing under load. Heat exchangers vary in number per reactor and in position. (F.S.)

3563

MERLIN—MEDIUM FLUX RESEARCH REACTOR. D. R. Chick and A. J. Salmon (Research Labs., Associated Electrical Industries Ltd.). Nuclear Eng. 2, 10-14(1957) Jan.

A medium-energy research reactor to provide a background of design and physics information and to use as a research tool is discussed. Designed for a thermal power of 5 Mw, it is moderated and cooled and partially shielded by light water. Fuel is an Al–U alloy enriched to 90% U^{235} and critical mass of the core is about 3.5 kg U^{235}. (F.S.)

3564

THE WORLD'S REACTORS. NO. 8. DIDO. Nuclear Eng. 2, 14a(1957) Jan.

A data sheet with specifications and cutaway view of DIDO, a thermal heavy water reactor, is given. (F.S.)

3565

DIDO. THE ENGINEERING ASPECTS. Nuclear Eng. 2, 15-22(1957) Jan.

The engineering aspects encountered in DIDO, an enriched U heavy water moderated reactor with a flux of 10^{14} n/cm^2-sec. at a thermal output of 10 Mw are discussed. The core, reactor structure, steel and Al tanks, shielding, D_2O, H_2O and He circuits, fuel changing, ventilation, buildings, safety, instrumentation and experimental facilities are described. (F.S.)

3566

DIDO—CONTROL SYSTEM. L. W. J. Newman (Nuclear Eng. Dept., H. M. Hobson Ltd.). Nuclear Eng. 2, 23-7 (1957) Jan.

Using a cadmium neutron absorber, the system comprises six coarse control shut-off units of the signal-arm type, a single fine control rod, and two safety rods. The control arms are driven through slave gearboxes ganged electrically to a master gearbox, and the fine control is operated from a gearbox controlled by a closed-loop servo system. (auth)

3567

REACTOR PHYSICS-8. James F. Hill (Senior Lecturer, Reactor School, Harwell). Nuclear Power 2, 29-32(1957) Jan.

The critical dimensions of bare cylindrical, spherical, or cubical reactors were obtained. A critical reactor with a reflector on the sides, or ends only, or surrounded was analyzed mathematically. (F.S.)

3568

FAST EFFECT IN LATTICE REACTORS. B. I. Spinrad (Argonne National Lab., Lemont, Ill.). Nuclear Sci. and Eng. 1, 455-60(1956) Dec.

An argument is made for defining the fast fission factor ϵ as the number of neutrons making first collision with moderator per neutron arising from thermal fission. Formulas for the fast effect in U^{238} lattices are presented; the (productive) absorption associated with fast effect is also formulated. The implications of this point of view with regard to measurements of resonance escape probability and resonance integrals are discussed. (auth)

3569

A METHOD OF ANALYSIS OF NATURAL CIRCULATION BOILING SYSTEMS. P. A. Lottes and W. S. Flinn (Argonne National Lab., Lemont, Ill.). Nuclear Sci. and Eng. 1, 461-76(1956) Dec.

The analysis presented has been developed for use in designing natural circulation boiling water nuclear reactors. Preliminary experimental information is given on density of steam water mixtures, velocity ratios of steam to water, and two phase friction factors for boiling in a vertical channel with uniform heat input. Experimental results of a natural circulation 600 psi boiling facility are compared with analytical results using this method. (auth)

3570

SEDIMENTATION OF THORIUM OXIDE SLURRIES AT ELEVATED TEMPERATURES. S. A. Reed and P. R. Crowley (Oak Ridge National Lab., Tenn.). Nuclear Sci. and Eng. 1, 511-21(1956) Dec.

Rates of sedimentation are reported for concentrated, flocculated aqueous suspensions of ThO_2 at temperatures from 150 to 325°C. Sedimentation tests were carried out in quartz tubes using a motion picture camera to follow sedimentation in the hindered settling region. The observed rates were used as a basis for calculating the effective particle diameters and densities of the sedimenting bodies at the elevated temperatures. The calculations are based on the premise that the slurries are agglomerated and that the nature of the agglomerates varies with temperature. (auth)

3571

REACTIVITY GAINS IN NRX IRRADIATED SLUGS. B. I.

Spinrad (Argonne National Lab., Lemont, Ill.). Nuclear Sci. and Eng. 1, 541-59(1956) Dec.

A number of samples of U irradiated in NRX have had their reactivities measured in CP-2 by the danger coefficient technique. By means of measurements on enriched, depleted, and poisoned unirradiated slugs, the reduction of the danger coefficient data to changed pile parameters ($\delta\eta/\eta$ and $\delta\Sigma/\Sigma$) has been accomplished. A brief discussion of the significance of the data has been included. (auth)

3572

MITR: THE MIT RESEARCH REACTOR. T. J. Thompson and T. Cantwell (Massachusetts Inst. of Tech., Cambridge). Nucleonics 15, No. 1, 38-40(1957) Jan.

The design of the heavy-water cooled and moderated reactor being constructed for research and educational purposes at the Massachusetts Institute of Technology is discussed. (W.L.H.)

3573

INSTABILITY IN SPERT-I. S. G. Forbes, F. Schroeder, and W. E. Nyer (Atomic Energy Div., Phillips Petroleum Co., Idaho Falls, Idaho). Nucleonics 15, No. 1, 41-3(1957) Jan.

The instability was manifested by a series of diverging power oscillations which are described in detail. (W.L.H.)

3574

COMPUTING 3-GROUP CONSTANTS FOR NEUTRON DIFFUSION. R. W. Deutsch (Knolls Atomic Power Lab., Schenectady, N. Y.). Nucleonics 15, No. 1, 47-51(1957) Jan.

A method is presented for calculating three-group constants for U^{235}-loaded homogeneous hydrogenous reactors. Used with digital computing machines they permit calculation of reactivity and flux distribution. (W.L.H.)

3575

EBR-I CORE: AFTER MELTDOWN. Nucleonics 15, No. 1, 84(1957) Jan.

3576

FABRICATING AND TESTING TUBULAR FUEL ELEMENTS. Samuel Storchheim (Nuclear Div., Glenn L. Martin Co., Baltimore, Md.). Nucleonics 15, No. 1, 85-91 (1957) Jan.

The fabrication and testing of thin-walled small-diameter tubular fuel elements for a heterogeneous reactor mobile-power package are described. (W.L.H.)

Refer also to abstracts 3268, 3269, 3460, 3461, 3462, 3465, 3523, 3617, and 3618.

NUCLEAR TRANSFORMATION

3577 AERE-M/M-130

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

NEUTRON INDUCED NUCLEAR REACTIONS IN SOLIDS RESULTING IN GAS FORMATION. G. B. Redding and R. S. Barnes. Oct. 4, 1956. 11p.

A list of gas producing neutron-induced nuclear reactions occurring in light solid elements is given with a method for determining the amount of gas produced. (auth)

3578 UCRL-3493

California. Univ., Berkeley. Radiation Lab.

FISSION AND SPALLATION COMPETITION FROM THE INTERMEDIATE NUCLEI AMERICIUM-241 AND NEPTUNIUM-235 (thesis). Walter Maxwell Gibson. Nov. 1956. 121p. Contract W-7405-eng-48. $0.60(OTS).

The yields of fission and spallation products of 9 to 24 Mev deuteron bombardments of Pu^{239} and U^{233} and of 18 to 46 Mev He ion bombardments of Np^{237} have been measured. Radiochemical methods were used to prepare the target materials and to separate and purify the products of the reactions studied. Determinations of primary fission yields indicate that the charge distribution in fission at these energies is intermediate to the equal charge displacement noted at lower energies and the constant charge to mass ratio suggested at very high energies but appears to be closer to the latter case. Fission yield curves have been determined which show the familiar transition from asymmetric to symmetric fission as the excitation energy is increased. An increase in the number of neutrons emitted before or during the fission process as the excitation energy is increased is noted by a gradual shift to lower mass of the center of symmetry of the fission yield curves. The results of the fission studies are interpreted qualitatively in terms of a statistical fission mechanism. No Z^2/A dependence of the relative fissionability of the target nuclides is noted. No apparent Z dependence is seen but a strong A dependence (fissionability increasing as A decreases) is suggested. The (d,2n) and (d,3n) excitation functions of Pu^{239} and the (α,2n) and (α,3n) excitation functions of Np^{237} have been compared to test the predictions of the compound nucleus model that σ (d,2n) : σ (d,3n) = σ (α,2n) : σ (α,3n) and σ (d,2n) : σ (α,2n) = σ_c (d) : σ_c (α) = σ (d,3n) : σ (α,3n). The predictions of the compound nucleus theory of Bohr are verified at all except the very lowest energies, indicating that these reactions are taking place predominantly by a compound nucleus mechanism. The (d,2n) and (α,2n) cross sections are radically affected by the magnitude of the fission reaction, hence the excitation functions for these reactions are very sensitive indicators of the relative fissionability of heavy nuclides at these excitation energies. The general features of the other spallation excitation functions (d,n), (d,dp), (d,αn), (α,n), (α,αn) are discussed. Direct intercation, or non-compound nucleus processes are used to explain most of the spallation excitation functions except for the (d,xn) and (α,xn) reactions where X > 2. The total reaction cross sections (fission plus spallation) correspond in each case to a nuclear radius $1.5 \times 10^{-13}\ A^{1/3}$ cm. A discussion of the determination of nucleometer (windowless methane flow proportional counter) counting efficiencies for the electron capture isotopes Am^{239}, Am^{240}, Np^{234} is appended. Counting efficiencies for other electron-capture isotopes are also discussed and summarized. (auth)

3579 UCRL-3495

California. Univ., Berkeley. Radiation Lab.

DEUTERON-INDUCED SPALLATION AND FISSION REACTIONS IN PLUTONIUM ISOTOPES (thesis). Ernie Victor Luoma. Nov. 1956. 35p. Contract W-7405-eng-48. $0.30(OTS).

Spallation products produced in bombardments of Pu^{238} and Pu^{240} with 9- to 23-Mev deuterons were isolated by chemical methods. In addition, fission products of Pu^{240} were isolated. Various isotopes of the elements separated were identified by their radioactive properties. Fission-yield curves at various energies are presented as well as absolute fission and spallation excitation functions. A marked suppression of the (d,2n) and (d,3n) reactions of Pu^{239} was found in comparison to those of Pu^{240}, apparently due to the increased fissionability of Pu^{239}. The cross section for the (d,α) reaction of Pu^{238} was determined for one deuteron energy. The usual increase of symmetry in the fission-yield curves of Pu^{240} was observed with the minimum vanishing with approximately 19-Mev deuterons. (auth)

3580 UCRL-3603

California. Univ., Berkeley. Radiation Lab.

ANALYSIS OF THE INTERACTION OF 300-MEV NEU-

TRONS WITH XENON (thesis). Richard Herbert Morris. Oct. 17, 1956. 71p. Contract W-7405-eng-48. $12.30 (ph OTS); $4.50(mf OTS).

An investigation of the interactions between 300-Mev neutrons and xenon was made by means of a cloud chamber in a pulsed magnetic field of 21,700 gauss placed in the neutron beam of the 184-inch Berkeley cyclotron. Eighty-seven negative pion events and 257 other stars were analyzed. In addition an experimental check was made on the energy of the incoming neutrons. Classification, identification, and angular and energy distributions of prongs associated with all events are presented. Interpretations of results are given. (auth)

3581

SPALLATION YIELDS FROM HIGH ENERGY PROTON BOMBARDMENT OF HEAVY ELEMENTS. J. D. Jackson (McGill Univ., Montreal, Quebec). Can. J. Phys. 35, 21-37(1957) Jan.

The Monte Carlo calculations of McManus and Sharp (unpublished) for the prompt nuclear processes occurring upon bombardment of heavy elements by 400-Mev protons are combined with a description of the subsequent neutron evaporation to determine spallation cross sections for comparison with experiment. The model employed is a schematic one which suppresses the detailed characteristics of individual nuclei, but gives the over-all behavior to be expected. Many-particle and collective effects such as alpha particle emission and fission are ignored. The computed cross sections are presented in a variety of different graphical forms which illustrate quantitatively the qualitative picture of high energy reactions first given. The calculations are in general agreement with existing data when fission is not an important effect, but the agreement does not imply a very stringent test of the various features of the model. (auth)

3582

γ-γ ANGULAR CORRELATION IN THE REACTION $C^{13}(p,\gamma)N^{14}$. Serge Gorodentzky, Andre Gallmann, Michel Crorssiaux, and Raymond Armbruster. Compt. rend. 244, 62-5(1957) Jan. 2. (In French)

3583

TOTAL CROSS SECTION OF (p,d) INTERACTION IN THE ENERGY INTERVALS OF 390 TO 650 MEV. V. P. Dzhelepov, and V. I. Moskalev (Inst. of Nuclear Problems). Doklady Akad. Nauk S.S.S.R. 110, 539-41(1956) Oct. 1. (In Russian)

The total cross sections were determined by measuring the collimated proton beam attenuation by specimens of common and heavy water in conditions of "favorable" geometry. The scheme of the procedure and tabulation of results are shown. The $\sigma p(d,p)$ in the energy range of 390 Mev practically coincides with the value $\sigma p(d,p) = (31.6 \pm 2) \times 10^{-27}$ cm^2, previously reported by C. P. Leavitt, for 408-Mev protons. With the change of proton energy from 390 to 650 Mev, the $\sigma(p,d)$ reaction increases about 25%. Tabulations showing the difference between the sum of total cross sections for free (p,p) and (n,p) collisions and the total (p,d) interaction section are shown and discussed. (R.V.J.)

3584

THE FULL EFFECTIVE CROSS SECTION FOR THE INTERACTION OF NEUTRONS WITH Li^6 AND Li^7 NUCLEI IN THE ENERGY RANGE FROM 10 TO 450 KEV. G. V. Gorlov, B. M. Gokhberg, V. M. Morozov, and G. A. Otroshchenko. Doklady Akad. Nauk S.S.S.R. 110, 963-5(1956) Oct. 21. (In Russian)

Results of the experiments showed the full effective cross section for Li^7 reached the maximum value $\sigma_t^{max} = 7.0 \pm 0.2$ barns at $E_{res} = 275$ kev; for Li^6 the $\sigma_t^{max} = 9.5 \pm 0.2$ barns at $E_{res} = 265$ kev. The increase in the full effective cross sections of neutrons in small energy ranges has been explained by the reaction $Li^6(n,t)He^4$. Tabulations are given for neutron energy values showing the relation of the energy to the thickness of the tritium target and to the angular distribution of neutrons leaving the target and captured in a recording counter. The tables of Li^6 and Li^7 full effective cross sections as well as the full cross-section curve made in relation to the energies of neutrons are presented. (R.V.J.)

3585

FURTHER MEASUREMENTS ON (n,p) REACTIONS AT 14 MEV. I. MAGNESIUM, SILICON, CALCIUM, ZINC, ZIRCONIUM. C. Badoni, L. Colli, and U. Facchini. Nuovo cimento (10) 4, 1618-22(1956) Dec.

Coincidences between scintillation and proportional counters were used to study the proton spectra from Si, Ca, Zr, Mg, and Zn bombarded with 14.5-Mev neutrons. The resultant proton spectra are shown. (B.J.H.)

PARTICLE ACCELERATORS

3586 MURA-204

Iowa State Coll., Ames and [Midwestern Universities Research Assn., Urbana, Ill.].

ELECTRICAL CHARACTERISTICS OF A MODEL MECHANICALLY TUNED RADIOFREQUENCY CAVITY FOR A MULTI-BEV SYNCHROTRON. R. Stump, J. Pavlat, W. Reed, and D. Zaffarano. [1956]. 28p.

The electrical properties of a "high Q" resonant cavity with a single tube oscillator operating directly in and controlled by the cavity volume are described for an FFAG accelerator. (F.S.)

3587 MURA-212

Midwestern Universities Research Assn., Urbana, Ill.

EFFECTS OF RESONANCES IN THE RADIAL SECTOR FFAG MODEL. L. W. Jones, Charles H. Pruett, and Kent M. Terwilliger. Dec. 21, 1956. 9p. Contract AT (11-1)-384. $3.30(ph OTS); $2.40(mf OTS).

A survey of a portion of the ν_x-ν_z plane has been made in the Michigan radial sector FFAG model to study the effects of resonances on the accelerated beam. No beam is observed on integral, half-integral, and linear sum resonances, as well as on the essential non-linear resonances $3\sigma_x = 2\pi$ and $2\sigma_z + \sigma_x = 2\pi$. Some other quadratic resonances attenuate the beam, but no effect is observed due to cubic or higher order resonances. $\sigma_x = 2\sigma_z$, $\sigma_x = \sigma_z$ and difference resonances have no noticeable effect on the beam. (auth)

3588 UCRL-1597

California. Univ., Berkeley. Radiation Lab.

PRELIMINARY CONSIDERATIONS REGARDING STABILITY OF MTA MARK I AS A CLOSED-LOOP SYSTEM. J. F. Waddell. Nov. 1, 1951. Decl. Feb. 28, 1956. 24p. Contract W-7405-eng-48. $4.80(ph OTS); $2.70(mf OTS).

Preliminary results are reported regarding the stability of the MTA Mark I as a closed-loop system. The calculations were performed graphically by superposing on the plane of the open loop transfer function a set of bipolar coordinates which are appropriately normalized. The discussion is based on performance of the open-loop system from which the closed-loop performance is directly predictable. (B.J.H.)

3589 UCRL-3365

California. Univ., Berkeley. Radiation Lab.

LINEAR ACCELERATOR FOR HEAVY IONS. Don Wells. Mar. 27, 1956. 4p. Contract W-7405-eng-48. $1.80 (ph OTS); $1.80(mf OTS).

A heavy-ion linear accelerator to produce ions of masses up to that of neon with energies of 10 Mev per nucleon is being developed. Ions are formed by a high-voltage arc in the ion source. They are then fed into the accelerator by an injector mechanism. A prestripper cavity which increases the energy picks up the ions and then they pass into a stripper that removes the electrons and also increases their positive energy. A poststripper then picks them up and adds the final increment of energy. (F.S.)

3590 UCRL-3372

California. Univ., Berkeley. Radiation Lab.

THE BEVATRON AND ITS PLACE IN NUCLEAR PHYSICS. E. J. Lofgren. Apr. 6, 1956. 16p. Contract W-7405-eng-48. $6.30(ph OTS); $3.00(mf OTS).

The operation and research program for the Bevatron, a proton synchrotron, which accelerates protons (stripped nuclei of H atoms) to an energy of 6.2 Bev are discussed. (F.S.)

3591

HIGH-CURRENT ION INJECTOR. William A. S. Lamb and Edward J. Lofgren (Univ. of California, Berkeley and Livermore). Rev. Sci. Instr. 27, 907-9(1956) Nov.

An ion injector is described which is capable of continuous currents of protons or deuterons of $^3/_4$ amp at 100 kv or pulsed currents of 2 amp at a 20% duty cycle. The beam comes to a focus about 3 in. in diameter and diverges at an angle of ±5°. It is approximately 95% atomic ions. (auth)

Refer also to abstract 3454.

RADIATION ABSORPTION AND SCATTERING

3592 AECU-3402

Westinghouse Electric Corp. Research Labs., East Pittsburgh, Penna.

COMPILATION OF TECHNICAL REPORTS ON THE SUBJECT OF FAST NEUTRON SCATTERING. PART II. NUCLEAR PHYSICS SECTION. 82p. Project NR-024-028. Contract N6-ORL-156-Task 2. $12.30(ph OTS); $4.50(mf OTS).

The spectrum of neutrons scattered at 90° by Mo was measured for 4.4-Mev neutrons by the proton recoil nuclear emulsion technique. The differential elastic cross section at 90° was calculated to be 36 ± 9 mb/sterad. The γ radiation at 0.92 ± 0.02 Mev from the fast neutron bombardment of Zr was compared with the 0.93-Mev γ ray from Nb^{92}. The experiments show an equivalence in energy within one per cent. The γ radiation from the fast neutron bombardment of Nb was studied using an NaI(Tl) crystal detector. Three discrete γ rays were detected at 521, 759, and 971 kev. A study was also made to determine the extent to which the complex square well model can be applied to fast neutron scattering on O. The calculation of moments of angular distributions is also briefly discussed. Other papers are included on neutron scattering by Al, Ca, Cr, and Bi; excited states of Zr^{92} and Zr^{94}; neutron inelastic scattering by Te, Ni, and Cu; and the theory of compound elastic scattering of neutrons. (B.J.H.)

3593

ANGULAR DISTRIBUTION AND POLARIZATION FOR ELASTIC SCATTERING OF 3.3-Mev NEUTRONS FROM Cu, Ta, Pb, AND W. Adolf Ernst Remund. Helv. Phys. Acta 29, 545-84(1956). (In German)

3594

CAUSALITY AND DISPERSION RELATIONS FOR THE SCATTERING OF MESONS BY FIXED NUCLEONS. R. Oehme (Univ. of Chicago, Ill.). Nuovo cimento (10) 4, 1316-28(1956) Dec.

The derivation of dispersion relations for meson-nucleon scattering is reexamined. So far, all proofs given require the assumption that the Fourier representation of the scattering amplitude exists in the unphysical energy region. In this note it is shown that in the limit of fixed nucleons the causality condition and the properties of the spectrum are already sufficient to derive dispersion formulae for the forward scattering amplitudes. With the same assumptions one can also derive dispersion relations for the derivative amplitudes. The complete relativistic case is discussed briefly in the appendix. (auth)

3595

ELASTIC SCATTERING OF α-PARTICLES. S. W. MacDowell and J. J. Giambiagi. Nuovo cimento (10) 4, 1594-6 (1956) Dec.

Some remarks are made concerning an explanation of the elastic scattering of α particles based on a nuclear model in which the protons are more concentrated close to the center than the neutrons. (B.J.H.)

Refer also to abstract 3628.

RADIATION EFFECTS

3596 NYO-7623

Brown Univ., Providence.

RADIATION DAMAGE STUDIES IN SOLIDS; NUCLEAR RESONANCE ABSORPTION TECHNIQUE. Period covered: January 1, 1956 through August 31, 1956. P. J. Bray Sept. 1, 1956. Includes three abstracts: NUCLEAR ELECTRIC QUADRUPOLE COUPLING IN GLASSES and NUCLEAR QUADRUPOLE COUPLING OF B^{11} AND Al^{27} IN IONIC CRYSTALS and B^{11} NUCLEAR MAGNETIC RESONANCE IN CRYSTALLINE BORON CARBIDE. P. J. Bray and A. H. Silver. Sept. 1, 1956. 22p. Contract AT(30-1)-1880. $4.80(ph OTS); $2.70(mf OTS).

A complete nuclear magnetic resonance spectrometer has been placed in operation. Many necessary and useful modifications of the commercial design are incorporated. The resultant instrument is good for the observation of resonances which can be studied with high r.f. levels. Subsidiary equipment (magnet, cryostat, etc.) is also in operation. Nuclear magnetic dipole resonance (NMR) investigations have been made of B_4C, KBF_4, $NaBH_4$, B_2O_3, and several glasses. Effects of the nuclear electrical quadrupole moment have been noted in most cases, and the observed splittings of the NMR lines have been correlated with structure and bonding knowledge. Samples have been sent out for irradiation. Line shape and spin-lattice relaxation time studies are in progress on alkali halides which have received electron or γ irradiation. Specimens which have experienced neutron bombardment will be studied when their irradiation period has ended. NMR studies of damaged metals are being started in Cu, Cu–Be alloys and Be. Investigation of radiation damage in molecular solids will begin shortly. Three appended abstracts summarize the publishable work to data on B_4C, glasses containing B, and ionic crystals containing B or Al. (auth)

3597 WADC-TN-56-115

Wright Air Development Center. Electronic Components Lab., Wright-Patterson AFB, Ohio.

GAMMA IRRADIATION OF GERMANIUM AND SILICON TRANSISTORS. Ralph J. Panos. Mar. 5, 1956. 113p. Project title: ELECTRONIC TUBES AND TRANSISTORS.

This Technical Note Supersedes WADC-TN-55-639 dated December 1955.

Two-hundred transistors were exposed to a γ source, Co^{60}, for various periods of time varying from 25 hours to approximately 200 hours. These units were electrically tested before radiation and at the following intervals after

radiation: zero hours, 25 hours, 50 hours, and 100 hours. One-hundred units were germanium and the other one-hundred were silicon transistors. Alpha (current gain) decreased as the period of radiation increased for both germanium and silicon transistors. Silicon type 904A had the least negative slope and silicon type 905 had the greatest negative slope. With increasing radiation, I_{co} generally increased slightly for silicon, however, in some cases I_{co} decreased below the pre-radiation value. The value of I_{co} increased greatly for germanium transistors with increased radiation. The silicon units did not recover as rapidly as the germanium units after radiation. More data and tests must be made in order to conclude which type of transistor, silicon or germanium, is less susceptible to radiation. Also neutron radiation, which has not been covered by this report, must be taken into account in the final analysis. (auth)

3598

RADIOLYTIC YIELDS OF NITROGEN AND HYDROGEN IN WATER BOILERS. Richard M. Bidwell, L. D. P. King, and Walter R. Wykoff (Los Alamos Scientific Lab., N. Mex.). Nuclear Sci. and Eng. 1, 452-4(1956) Dec.

Yields of N_2 and H_2 from several Water Boiler $UO_2(NO_3)_2$ solutions were measured in the presence of excess O_2 gas. Nitrogen yield increased with increased $UO_2(NO_3)_2$ concentration, but hydrogen yield decreased. The H_2 yields agreed with those obtained by different techniques at the Oak Ridge National Laboratory. The N_2 yield for a $UO_2(NO_3)_2$ solution 1.0M in nitrate is 0.004 molecule N_2 per 100 ev. (auth)

3599

THE OPTICAL EFFECTS OF RADIATION INDUCED ATOMIC DAMAGE IN QUARTZ. E. W. J. Mitchell and E. G. S. Paige (The Univ. of Reading). Phil. Mag. 1, 1085-1115(1956) Dec.

Measurements of the optical absorption of neutron irradiated crystalline and fused quartz have been made in the wavelength range 1450 to 10,000 A (8.5 to 1.2 ev). Two absorption bands associated with atomic displacements in crystalline quartz have been found—C at 5.7 ev and E at 7.6 ev. Optical bleaching of the C band, when illuminated with light of the wavelength absorbed, occurs even in the purest specimens. A preferential optical and thermal bleaching is observed at 5.4 ev during the early stages of the bleaching of neutron irradiated specimens. It is suggested that this effect is associated with electron release and capture, without intermediate retrapping, by a close complementary pair of traps. The model which seems to fit the results best is that the C and E defects are oxygen ion vacancies and interstitial oxygen ions, which produce absorption bands after trapping electrons and holes, respectively. The C and E bands are also found in fused quartz. Results obtained using thin specimens show that the absorption in the long wavelength tail of the absorption edge was enhanced during irradiation. The absorption limit in irradiated crystalline quartz is at 8.1 ev and is the same as that found in both unirradiated and irradiated fused quartz specimens. The extension of the tail is interpreted as arising from the formation of regions of amorphous material as a result of local melting. This is taken into account in estimating the concentration of point defects on the basis of collision theories. All the damage is annealed by heating at 950°C. (auth)

Refer also to abstracts 3373 and 3470.

RADIOACTIVITY

3600

THE ELECTRON CAPTURE DECAY OF ^{228}Pa. Ong Ping Hok and E. Arbman. Arkiv Fysik 11, 193-200(1956).

The radiations of Pa^{228} were investigated with a double-focusing beta-ray spectrometer and with a scintillation counter. 43 conversion lines were detected, which could be ascribed to 18 gamma transitions. The energies of most of these transitions agree fairly well with those found in the decay of $MsTh_2$. Multipolarities were assigned to the different transitions. A decay scheme is suggested based on the $\gamma-\gamma$ coincidence measurements of Box and Klaiber, comprising a rotational level system at 57.48 and 186.1 kev and perhaps also at 1070 and 1125 kev. (auth)

3601

SEARCH FOR DOUBLE β DECAY IN Ca^{48}. E. I. Dobrokhotov, V. R. Lazarenko, and S. Yu. Luk'yanov. Doklady Akad. Nauk S.S.S.R. 110, 966-9(1956) Oct. 21. (In Russian)

Two sets of disks prepared by compression of the CaF_2 dust into disks 33 mm in diameter were used. One pair of specimens was enriched with Ca^{48} (up to 76.2%) containing 423 and 259 mg of Ca^{48}, respectively; the controlling pair was enriched with Ca^{44}(94.7%) and Ca^{40}(99.9%). The measurements were taken by method of coincidences on the specimens placed between two scintillation counters surrounded by a liquid scintillator. Two installations, one 33 m underground and the other on the surface surrounded by a layer of lead (15 cm) and steel (3 cm) were used for the experiment. The scheme of the installations and the table of resolving number of impulse of coincidences per 100 hr in the interval of 3.2 Mev are shown. (R.V.J.)

3602

SYSTEMATICS OF NUCLEAR DECAY. II. SPECTROSCOPIC REGULARITY. A. Bisi, E. Germagnoli and L. Zappa (Istituto di Fisica Sperimentale del Politecnico, Milano and Laboratori CISE, Milano). Energia Nucleare (Milan) 3, 376-89(1956) Oct. 15. (In Italian)

Empirical regularities in β and γ decays are reviewed and compared with the predictions of nuclear models. (auth)

3603

DECAY OF W^{131}. P. Debrunner, E. Heer, W. Kundig, R. Ruetschi and T. Lindquist. Helv. Phys. Acta 29, 432-4 (1956). (In German)

3604

HIGH LEVEL ROTATION STATE OF SOME NUCLEI. THE α-DECAY INTENSITY OF VARIOUS ROTATION EXCITATION LEVELS. L. L. Gol'din, G. I. Novikova, and E. F. Tret'yakov. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 868-74(1956) Aug. (In Russian)

Detailed studies were made of α spectra of the Am^{241}, Pu^{240}, and U^{233}. The results obtained permitted the first comparison of the experimentally obtained formulas with the theoretical formulas. Investigation was made of the Landau formula $(P = C(2I + 1)\exp\{-\alpha I(I + 1)\}$; where P is the probability of α decay for the given level; C is the normalizing multiplier; I is the nuclear spin in the excited state; and, α is the constant determinant in the experiment. This formula described well the intensity of α decay at various levels for even-even parity nuclei. For odd-parity nuclei, the picture is not yet clear. (R.V.J.)

3605

SPECTRUM OF THE INTERNAL CONVERSION ELECTRONS OF THE ACTIVE PRECIPITATION RdThI (in the $H\rho$ = 2600 to 1030 Gs·cm). E. M. Krisyuk, A. D. Vitman, V. D. Vorob'ev, G. D. Latyshev, and A. G. Sergeev (Obraztsov Leningrad Inst. of Transportation). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 877-82(1956) Aug. (In Russian)

Calculations were made to determine with greater accuracy the energies and intensities of RdTh active precipitation conversion lines. (R.V.J.)

3606

INTERNAL CONVERSION IN Pb^{208} ATOM AT 2615 KEV TRANSITION. E. M. Krisyuk, A. D. Vitman, et al (Obraztsov Leningrad Inst. of Transportation). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 883-90(1956) Aug. (In Russian)

Measurements were made of the internal conversion coefficient in the Pb^{208} K shell at 2615 kev and a value $\alpha_K = (1.65 \pm 0.07) \times 10^{-3}$ was obtained. The experimental results were compared with the theoretical data using L. A. Sliv (Zhur. Eksptl.' i Teoret. Fiz. 31, 134(1956)) new conversion coefficient tables which had been calculated with corrections for the finite dimensions of nuclei and therefore more accurate than the tables previously available. (R.V.J.)

3607

BETA SPECTRUM OF Pu^{241}. K. N. Shlyagin. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 891-5(1956) Aug. (In Russian)

For the heavy elements in the Mendeleev periodic system $\Delta E_{Z,Z+1}$ approaches the value of –15 to 25 kev, consequently it is feasible to expect that the electron shell transitions would affect the pattern of the β spectra whose boundary energy is near $\Delta E_{Z,Z+1}$. Studies were undertaken to find if β spectra would be totally shifted into the high energy levels at the value $\Delta E_{Z,Z+1}$. The β spectrum of Pu^{241} with the roughly measured upper spectra boundary E_0 = 10 to 20 kev and half decay period of T = 10 to 14 years was taken as the subject of investigation. (R.V.J.)

3608

INVESTIGATIONS OF CONVERSION ELECTRON SPECTRA OF Ba^{137}, In^{113}, AND In^{115} ISOMERS IN β SPECTROMETER WITH THICK EMULSION. I. A. Antonova (Lomonosov Moscow State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 896-902(1956) Aug. (In Russian)

A new method of electron recording in a sensitive thick emulsion in a β spectroscope has been developed. The results showed a 300- to 500-time stronger sensitivity of the thick emulsion, as compared to that of photographic density blackening. Consequently, the method permits the investigation of isotopes of several microcuries which is practically impossible to accomplish by any other method. Diagrams of Ba^{137} and In^{113} spectra of conversion electrons and γ-ray internal conversion coefficient tables for Ba^{137}, In^{113}, and In^{115} are presented. (R.V.J.)

3609

LUMINESCENCE SPECTROMETER INVESTIGATIONS OF Ir^{192} STRONG γ EMISSION. N. N. Delyagin, G. A. Kuznetsova, and V. S. Shpinel (Lomonosov Moscow State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 909-12(1956) Aug. (In Russian)

Measurements were made of Ir^{192} γ radiation in the strongest range of γ transitions. The analysis of relative transition intensities, the Ir^{192} decay scheme, and comparison of the experimental data with theoretical formulas are presented in diagrams and tabulations. (R.V.J.)

3610

THE DECAY SCHEME OF Zr^{97} AND Nb^{97}. N. N. Delyagin, A. A. Sorokin, N. B. Forafontov, and V. S. Shpinel. (Lomonsov Moscow State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 913-24(1956) Aug. (In Russian)

During the conference on Nuclear Spectroscopy in 1955, a report was made describing the studies of Zr^{97} and Nb^{97} decay scheme which had been investigated by the method of $\beta-\gamma$ and $\gamma-\gamma$ coincidences. The method permitted the separation of the soft β spectra for Zr^{97} and Nb^{97} from the total β spectra of Zr^{97} + Nb^{97}, and revealed the $\gamma-\gamma$ coincidence with the intensity of ~10%. The energy of cascade quanta, evaluated by the absorption method was found to be ~0.7 Mev and >1 Mev. To obtain a more accurate result the work has been repeated and measurements checked on improved apparatus and the results of the work are given. (R.V.J.)

3611

GAMMA-RAY SPECTRA OF Sb^{124}. B. S. Dzhelepov, N. N. Zhukovskiĭ, V. G. Nedovesov, I. F. Uchevatkin, and V. G. Chumin. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 925-32 (1956) Aug. (In Russian)

Studies were made to determine the relative intensities of γ lines in the Sb^{124} γ spectra. The investigations were carried out on the Elotron (γ-spectrometer with improved focusing using the electron recoil). The descriptions and design of the apparatus, the diagrams of measurements of the Sb^{124} γ spectra and tabulations are presented. (R.V.J.)

3612

ABOUT 0 → 0 TRANSITION IN RaC′. B. S. Dzhelepov, and L. A. Shestopalova (Mendeleev All Union Research Inst. of Metrology). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 20, 933-40(1956) Aug. (In Russian)

The half-width band of 4.7% instead of the normally expected 2.8% has been revealed in the investigation RaC′ electron recoil spectra at 1350 to 1450 kev level. This lead to the assumption of the presence of a group of lines among which the component 1378 kev was already known from previous works, the other lines were in energies near 1410 kev. Conversion coefficients on the K shell in various multiple transitions from $h\nu$ = 1416 kev produced the values of 1385.3, 1396.5, 1401.7, 1408.0, and 1438.0 kev which form the above mentioned electron surplus. Three types of decay schemes are shown for the RaC′ lower level of excitations. Analysis was made of four types of electron discharge at the 1416 kev level to determine the theory of 0 → 0 transitions. (R.V.J.)

3613

FOUR SIMPLE, VERSATILE COBALT-60 FACILITIES. 1. GOODRICH FACILITY. R. G. Bauman (B. F. Goodrich Research Center, Brecksville, Ohio). 2. RENSSELAER POOL. 3, 4. TWO SMALL COBALT FACILITIES. P. B. Aitken, P. J. Dyne, and E. C. Trapp (Atomic Energy of Canada, Ltd., Chalk River, Ont.). Nucleonics 15, No. 1, 96-101(1957) Jan.

3614

ON THE DECAY OF ^{132}Cs. K. S. Bhatki, R. K. Gupta, and S. Jha (Tata Inst. of Fundamental Research, Bombay). Nuovo cimento (10) 4, 1519-24(1956) Dec.

Gamma rays from 7-day Cs^{132} have been studied in a scintillation spectrometer with a large well-type NaI crystal. In addition to the 670-kev γ ray, 1080-kev, 1200-kev, and 1300-kev γ rays have been observed. From the sum peaks, levels in Xe^{132} at 670 kev, 1440, 1960, and 2200 kev are inferred. From the sum peak areas, the intensities of electron capture to different levels have been estimated. A tentative decay scheme has been suggested. (auth)

3615

DETERMINATION OF THE MAXIMUM ENERGY OF Xe^{138} (17 min.) AND Xe^{137} (3.8 min.) BY ABSORPTION. Sonia J. Nassiff and W. Seelmann-Eggebert. Publs. com. nacl. energia atomica (Buenos Aires) Ser. quim. 1, No. 6, 53-62 (1956). (In Spanish)

The maximum β energy of Xe^{138} and Xe^{137} was determined by absorption in Al. In the first case a special chamber was used for electrodeposition of Cs which had to be eliminated. The β energies were found to be: 2.4 Mev for Xe^{138} and 3.5 Mev for Xe^{137}. Gamma radiation corresponding to the two Xe isotopes was detected. (auth)

3616

DESIGN OF A HIGH LEVEL GAMMA SOURCE FOR RADIATION STERILIZATION IN HOSPITALS. L. E. Brownell, S. N. Purohit, and E. W. Coleman. Strahlentherapie 36, 255-63(1956).

A design is presented for a compact semimobile Co^{60} γ-radiation unit for use in hospitals for the sterilization of homograph materials such as bone-bank bone, aorta, and cartilage. (C.H.)

RARE EARTHS AND RARE-EARTH COMPOUNDS

3617

RARE EARTHS SHOW PROMISE AS REACTOR CONTROL MATERIALS. W. Kermit Anderson (Knolls Atomic Power Lab., General Elec. Co., Schenectady, N. Y.). Nucleonics 15, No. 1, 44-6(1957) Jan.

The advantages and disadvantages of some rare earths as reactor control materials are listed. (W.L.H.)

SHIELDING

3618 CF-57-1-46

Oak Ridge National Lab., Tenn.

CALCULATION OF SHIELD INDUCED GAMMA RADIATION ESCAPING THROUGH OPENINGS IN A BIOLOGICAL SHIELD—APPLICATION TO THE HRT. H. C. Claiborne and T. B. Fowler. Jan. 11, 1957. 19p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A method was developed for calculating shield induced gamma radiation escaping through openings in a biological shield. The method was applied to the HRT and the results indicated that the contribution to the dose from induced activity in the HRT shield was around 0.1 r/hr and was insignificant in comparison to other mechanisms contributing to the escape of gamma rays through shield openings. (auth)

3619

.\ROAD BEAM ATTENUATION DATA FOR 50 TO 300 KVP X-RAYS. E. Dale Trout, John P. Kelley, E. J. Furno, and A. C. Lucas (General Electric Co., Milwaukee, Wisc.). Nondestructive Testing 14, 24-7(1956) Nov.-Dec.

X-ray installations operating at voltages up to 300 kvp have generally made use of lead shielding. The use of concrete as a shielding material has usually been considered in the case of installations operating at 400 kvp or more. At the lower voltages, lead is a very effective barrier since photoelectric absorption accounts for most of the attenuation at the lower energies. In the planning of new installations it may be desirable to use concrete even at the lower voltages because of the ease of installation or for structural reasons. There are also instances where existing concrete structures may be used to provide all or part of the necessary shielding. (auth)

3620

GAMMA ATTENUATION WITH BUILDUP IN LEAD AND IRON. David G. Chappell (Knolls Atomic Power Lab., Schenectady, N. Y.). Nucleonics 15, No. 1, 52-3(1957) Jan.

Nomograms are presented which give attenuation factors for Pb and Fe shielding slabs used with point γ sources. They include the effect of buildup. (W.L.H.)

SPECTROSCOPY

3621

THE TENTH ALL-UNION CONFERENCE ON SPECTROSCOPY. G. S. Landsberg. Priorda 45, No. 11, 43-7(1956) Nov. (In Russian)

A review is given of reports on molecular and atomic spectroscopy. (R.V.J.)

3622

NEW SOURCE TECHNIQUE FOR BETA-RAY PERMANENT MAGNET SPECTROGRAPHS. Frederick P. Cranston, Jr., and William J. McCreary (Los Alamos Scientific Lab., New Mexico). Rev. Sci. Instr. 27, 973(1956) Nov.

Electrophoretic deposition of source material on a fine wire has proved to be a satisfactory method for preparing sources for β-ray permanent magnet spectrographs. Excellent Er_2O_3 and ThF_4 sources were prepared. (F.S.)

THEORETICAL PHYSICS

3623

ON THE POTENTIAL IN THE COUPLING THEORIES OF NUCLEAR FORCES. Yu. M. Lomsadze (Uzhgorodskiĭ State Univ.). Doklady Akad. Nauk S.S.S.R. 110, 545-8 (1956) Oct. 1. (In Russian)

An attempt was made to resolve a problem (new to the coupling theory) of eliminating the infinities, which, in contrast to non-coupling theory, occur in the first non-cut off order of perturbation. (R.V.J.)

3624

REPRESENTATION OF MESON FIELD WITH RETARDING POTENTIALS. I. S. Arzhanykh (Romanovskiĭ Inst. of Mathematics and Mechanics USSR). Doklady Akad. Nauk S.S.S.R. 110, 953-6(1956) Oct. 21. (In Russian)

3625

ON THE HYDRODYNAMICAL MODEL IN MULTIPLE PRODUCTION OF MESONS. M. Hamaguchi (Inst. of Theoretical Physics, Kyoto Univ., Japan). Nuovo cimento (10) 4, 1242-61(1956) Dec.

The viscous stress tensors in the relativistic covariant form are introduced in the description of multiple production of the particles in high-energy collisions. As the results, the effects of viscosity are calculated in 1-st order approximation and also the qualitative differences from Landau's theory are discussed on the basis of the conception of irreversibility in relativistic thermodynamics. (auth)

3626

COHERENCE EFFECTS IN THE LEE-YANG PARITY DOUBLET THEORY OF STRANGE PARTICLES. R. Gatto. Nuovo cimento (10) 4, 1274-84(1956) Dec.

It is shown that certain coherence effects occur in the parity doublet theory of strange particles which may give rise to peculiar time and angular dependences in angular correlations. The possibility of observing such effects is closely related to the values of the mass differences in the parity doublets, and it would in fact permit measurement of the mass differences. A condition for the observability of the coherence effects is that the electromagnetic interaction be minimal. Other physical aspects of the theory, such as the time dependence of the decay rates, the lifetimes of hyperons, and the parity doublet structure of hyperfragments, are discussed. (auth)

3627

DISPERSION RELATIONS FOR PHOTOPRODUCTION OF MESONS. E. Corinaldesi (The Univ. of Glasgow). Nuovo cimento (10) 4, 1384-98(1956) Dec.

The Feynman amplitude for the reaction γ + nucleon → → π + nucleon is simply related to a causal amplitude which satisfies dispersion relations. These are derived in the "natural" frame. The connection with the amplitudes in the center of mass frame is discussed in detail. (auth)

3628

NUCLEON RECOIL IN THE PION-NUCLEON SCATTERING. L. Fonda and I. Reina. Nuovo cimento (10) 4, 1399-1409 (1956) Dec.

The effect of nucleon recoil has been taken into account in the extended source theory of pion-nucleon scattering with PS-PV interaction Hamiltonian. The results on P-waves were compared with experimental data and with the

results of the Chew's cut-off theory and the influence of nucleon recoil in the determination of the renormalized coupling constant was discussed. In order to discuss, on the same theoretical line, the influence of nucleon recoil on S-phases, we have added to the PS-PV interaction Hamiltonian two terms, which are bilinear in the meson field, as can be obtained from a Dyson-Foldy transformation applied to the PS-PS coupling. The effect of nucleon recoil is found to be remarkable. (auth)

3629
THE CONTEMPORARY INTERPRETATION OF THE ELEMENT PARTICLE THEORY. V. Geizenberg. Uspekhi Akad. Nauk 60, 413-22(1956) Nov. (In Russian)

A review is given of elementary particle theory presented at the Physics Conference in Wiesbaden Sept. 23, 1955. (R.V.J.)

3630
RADII OF CURVATURE METHOD FOR GRAPHOANALYTICAL PLOTTING OF CHARGED PARTICLE SPATIAL TRAJECTORIES IN ELECTROSTATIC FIELDS. N. I. Shtepa. Zhur. Tekh. Fiz. 26, 2281-6(1956) Oct. (In Russian)

Trajectories of charged relativistic and nonrelativistic particles in electrostatic fields have been plotted by this method. The results showed that the method can be successfully applied to resolve practical problems in cases when the distribution of the field potential along the trajectories is known. (R.V.J.)

URANIUM AND URANIUM COMPOUNDS

3631
EFFECT OF GEOMETRY ON RESONANCE NEUTRON ABSORPTION IN URANIUM. Lawrence Dresner (Oak Ridge National Lab., Tenn.). Nuclear Sci. and Eng. 1, 501-10(1956) Dec.

A simple theoretical expression has been derived for the geometric dependence of the effective resonance integral of uranium which is independent of the details of resonance structure. Comparison with experiment yields good agreement when the surface absorption is arbitrarily reduced to 60% of the theoretical value. (auth)

3632
CRYSTALLIZATION YIELD. M. F. Buhler. Publs. com. nacl. energia atomica (Buenos Aires) Ser. quim. 1, No. 5, 43-52(1956). (In Spanish)

The determination of the crystallization yield of water solutions of uranyl nitrate, by means of specific weight measurements, is discussed. (tr-auth)

PATENTS

CHEMISTRY

3633
SEPARATION OF METALS. T. V. Healy (to U. K. Atomic Energy Authority). British Patent 761,252. Nuclear Eng. 2, 44(1957) Jan.

The selective precipitation of compounds from aqueous solutions of metal nitrates, which form basic compounds at pH values up to pH 3, are treated with formaldehyde at a temperature at which formaldehyde reacts with the nitrate ion. The treatment is preferably carried out at the boiling point of the solution. At about pH 2 or 3, ferric iron precipitates from a solution of ferric, nickel, and chromium nitrates in a relatively pure form. Passage of the formaldehyde is then discontinued while the solution remains at boiling point until precipitation is complete. In a similar manner ferric iron may be separated from cerous nitrate and from copper. Zr and Sn may be separated from Ni, Cr, Cu and Ce. (auth)

ENGINEERING

3634
PRESSURE-RELIEF VALVES FOR DENSE VAPOURS. E. S. Allen (to U. K. Atomic Energy Authority). British Patent 760,971. Nuclear Eng. 2, 44(1957) Jan.

Vapor-relief valves may be held open against spring load by an inertia reaction force due to the momentum of the vapor. This force is large for heavy vapor, resulting in considerable reseating delay. Valves designed to reseat after a 3% blow down of steam pressure are found to blow down at 50%. To reduce the blow-off pressure loss, the inertia reaction force is reduced by a mushroom-shaped member with curved vapor guides on the underside, integral with the body of the relief valve. The reaction force is absorbed by the guides and not transmitted to the valve-closure member. (auth)

3635
GAUGE FOR MEASURING CURVATURE. L. N. Snell (to U. K. Atomic Energy Authority). British Patent 761,090. Nuclear Eng. 2, 44(1957) Jan.

A gage for measuring curved surfaces is made by using a mechanical or electrical three-point contact, the points being at the corners of an isosceles triangle. A metal capacity probe on a line drawn perpendicularly to the base through the apex is located so as to be capacity sensitive to the convex or concave curvature of a surface in contact with the three points. (F.S.)

PHYSICS

3636
METHOD AND MEANS FOR PRODUCING PHOSPHORS. R. Lapage, S. K. Hutchinson, and K. T. B. Scott (to U. K. Atomic Energy Authority). British Patent 761,050. Nuclear Eng. 2, 44(1957) Jan.

A molten phosphor of stilbene, anthracene, tolane, or naphthalene is slowly cooled in a sealed cylindrical vessel terminating in a cone with a baffle in the conical portion having a 1-mm hole or capillary extension from the apex with an "S" bend. Crystalline growth is initiated in the apex or its extension. (auth)

3637
POLYMERIC SUBSTANCES. A. Charlesby (to U. K. Atomic Energy Authority). British Patent 761,051. Nuclear Eng. 2, 44(1957) Jan.

Polyvinyl-vinylidene chloride, polyethylene oxide wax or cellulose nitrate are subjected to ionizing radiation sufficient to increase resistance to solvent action but not sufficient to change the mechanical properties measured at ordinary temperature. (Additional to B.P. 732,047.) (auth)

3638
METHOD OF AND MEANS FOR CONVERTING THE ENERGY OF NUCLEAR RADIATIONS INTO USEFUL ELECTRICAL ENERGY. (to Radio Corporation of America, U. S. A.). British Patent 761,404. Nuclear Eng. 2, 44(1957) Jan.

A semi-conductive body is irradiated and an electric potential developed between output contacts on each side of the irradiated barrier region, which then may be fed into a load circuit. The radioactive battery includes a cold source of high-energy nuclear radiation emitted from Po, U, Sr^{90}, Co^{60}, or tritium. (F.S.)

3639
TESTING OF SOLID MATERIAL FOR DETERMINING SPE-

CIFIC RADIATION ABSORPTION CAPACITY AND APPARATUS THEREFORE. (to Stamicarbon N. V., Netherlands). British Patent 762,432. Nuclear Eng. 2, 44(1957) Jan.

The sample is spread out as a layer. The irradiating (roentgen-ray) beam and the sample are moved at uniform velocity so that during a certain period of time the beam irradiates the whole or a predetermined fraction of the sample. The radiation which emerges and that which does not pass the sample material impinges on detectors connected to compensating means. These operate in accordance with the change of the intensity of the detected radiation to maintain the intensities equal or in constant proportion. The operations, which are a measure of the absorption capacities of the successive parts of the sample, are automatically integrated to give a single specific absorption capacity value indication for the entire sample. In the tests, use was made of a roentgen-ray tube with cobalt anode and beryllium window, operated with a 14-kv tension and equipped with an Fe filter. (auth)

3640

VALVE OSCILLATOR CIRCUIT ARRANGEMENTS. E. Franklin and D. Williams (to U. K. Atomic Energy Authority). British Patent 761,773. Nuclear Eng. 2, 44(1957) Jan.

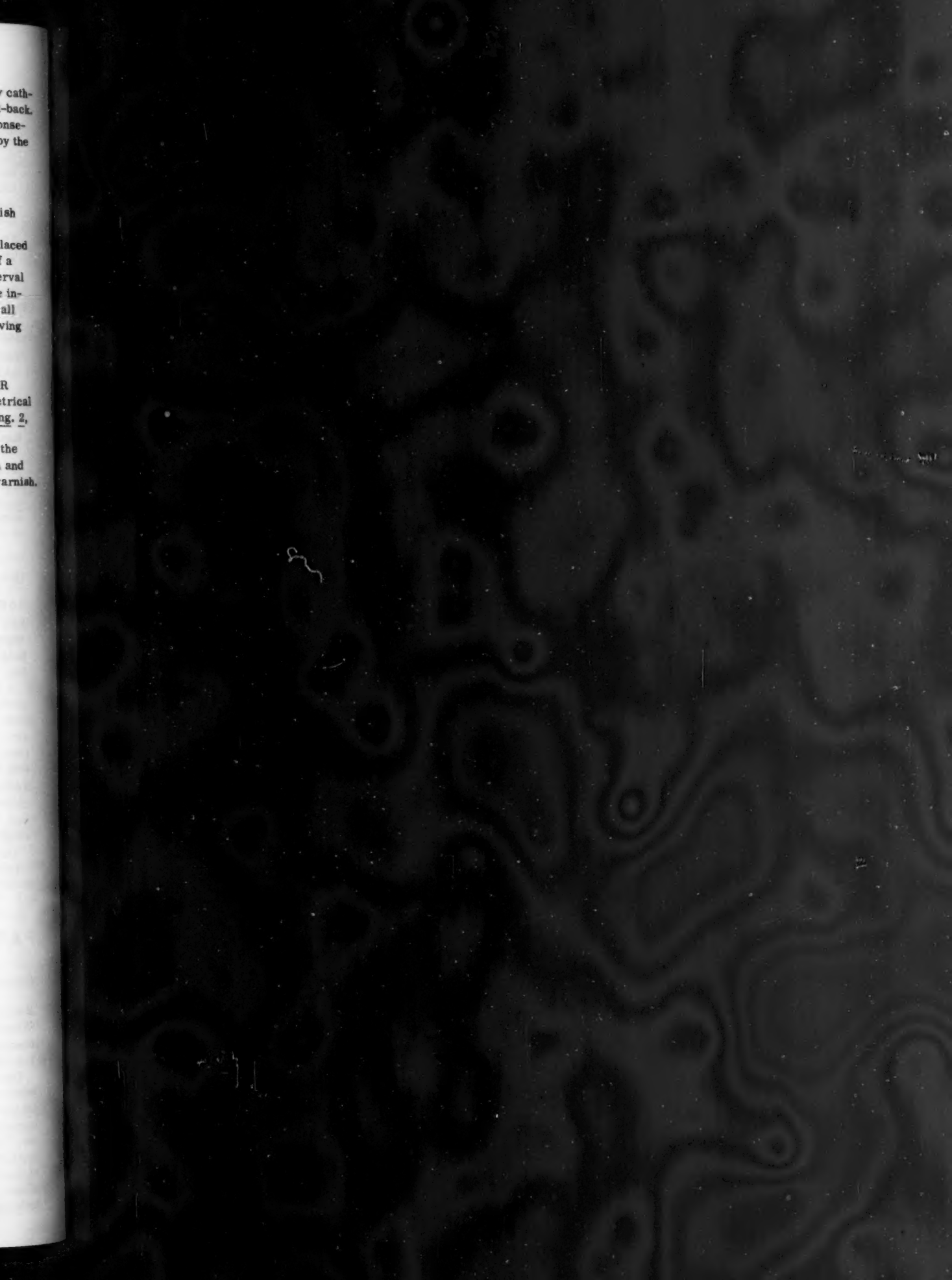
For generating a stabilized high voltage direct current (rectified from an amplified a.c.) from a direct current source of lower voltage. A three-electrode cold-cathode valve has a trigger electrode with a separate auxiliary cathode to which a fraction of the d.c. output voltage is fed-back. This regulates the trigger break-down potential and consequently the amplitude of the a.c. waveform generated by the valve. (auth)

3641

DIGITAL COMPUTING APPARATUS. E. H. Cooke-Yarborough (to U. K. Atomic Energy Authority). British Patent 761,878. Nuclear Eng. 2, 44(1957) Jan.

A means for storing multi-digit numbers in an interlaced manner in a computer so that the consecutive digits of a number, when stored, each occupies a minor time interval located in consecutive regularly recurring major time intervals. Digits associated with a major time interval all have the same significance. The computer is time-saving and requires less storage capacity. (F.S.)

3642

WINDOW UNIT OF SCINTILLATION DETECTORS FOR ALPHA PARTICLES. W. A. Bayfield (to Philips Electrical Industries Ltd.). British Patent 760,901. Nuclear Eng. 2, 44(1957) Jan.

Foils of an opaque material (aluminum) permitting the passage of particles are supported by tensioned nylon and silk threads secured by an adhesive such as shellac varnish. The assembly is mounted in a rigid frame. (auth)